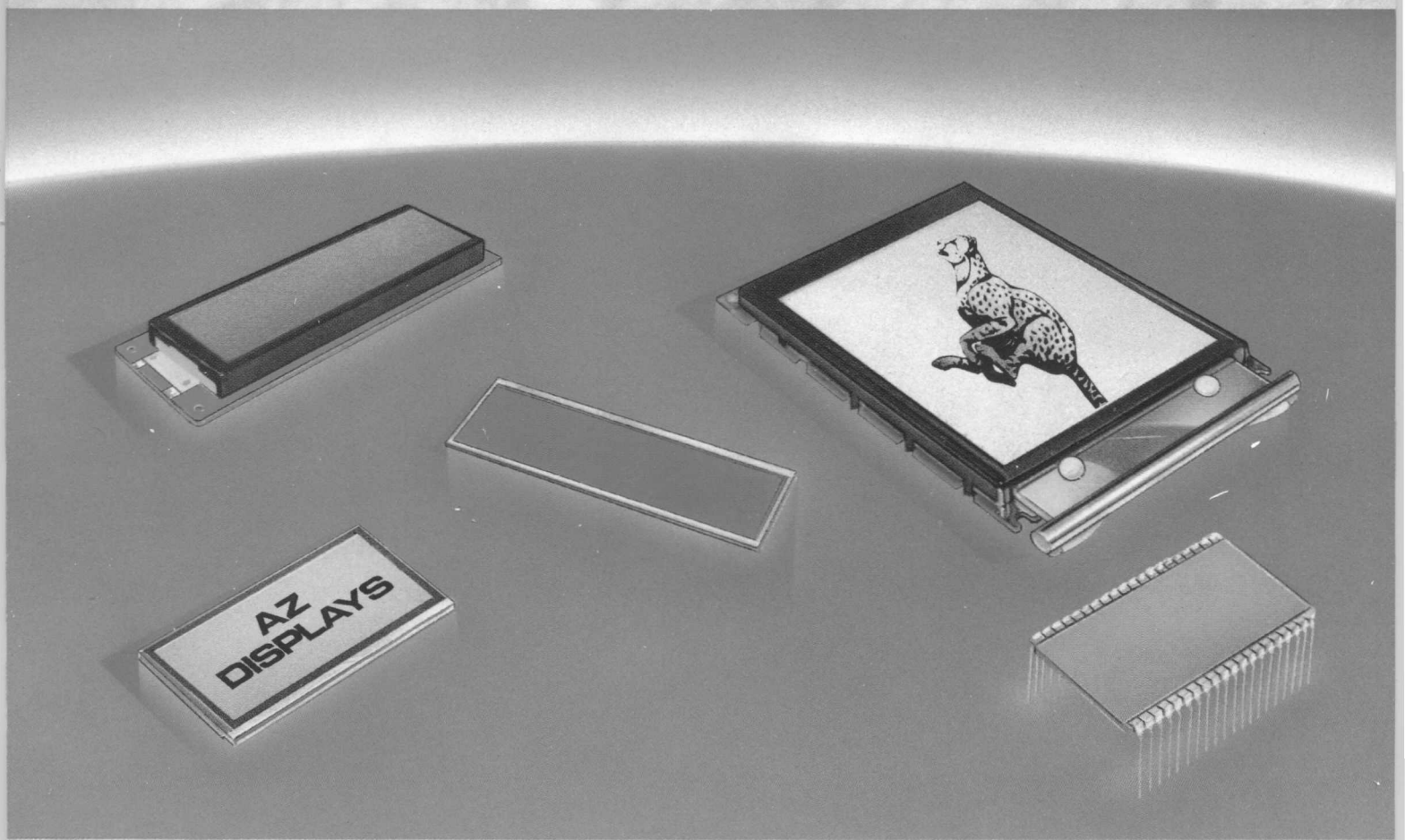
LIQUID CRYSTAL DISPLAYS



AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

CORPORATE PROFILE

AZ Displays, Inc. is well-renowned for traditional craftsmanship and engineering excellence. Headquartered in Southern California, AZ Displays, Inc. offers a broad range of standard character and graphic LCD modules designed for the industrial OEM market. We also have the capability to provide custom LCD panels and custom LCD modules for specialized applications.

Our sales, marketing, technical support, quality control, and customer service departments are located in our 50,000 square foot building in Aliso Viejo, CA. Our highly knowledgeable sales force works closely with an experienced applications engineering department to help define the needs of our customers and to provide the best technical solutions.

AZ Displays, Inc. is committed to providing the highest quality products to our customers. Our engineers monitor our Asian factories to ensure that our product quality meets the highest possible standards. In addition, all products undergo quality assurance testing at our California headquarters.

Along with quality LCD products, AZ Displays, Inc. provides competitive pricing, on-time deliveries and superior customer service. We welcome the opportunity to demonstrate our capabilities to your company.

TABLE OF CONTENTS

MODULE PART NUMBERING SYSTEM

1 2 3 – 4 5 – 6 7 8

1 Module Type
AGM = AZ Displays Graphic Module
ACM = AZ Displays Character Module

2 Module Format
1602 = 16x2
2004 = 20X4
4002 = 40x2
2464 = 240x64
3224 = 320x240
1264 = 128x64

3 Design Version
A through ZZ for different PCB sizes, controller IC's, etc.
(Combine with module format to arrive at base model number.)

4 Polarizer Type
R = Reflective
M = Transmissive, Positive
F = Transflective
N = Transmissive, Negative

5 Backlight Type
N = None
L = LED
E = EL
C = CCFT

6 Fluid Type
T = TN
B = Blue mode STN
Y = Yellow mode STN
G = Gray mode STN
F = FSTN (Film-compensated STN [B/W])

7 Viewing Direction
B = Bottom View (6 o'clock)
T = Top View (12 o'clock)

8 Temperature Range and Power Supply
S = Standard temp range w/single supply voltage
D = Standard temp range w/dual supply voltages
W =Wide temp range w/single supply voltage
H = Wide temp range w/dual supply voltages

EXAMPLE: ACM 1602M- R N - Y B S
1 2+3 4 5 6 7 8

1 = Character Module
2 + 3 = Base Model Number
4 = Reflective Polarizer
5 = No Backlight
6 = Yellow Mode STN
7 = Bottom View
8 = Standard temp range w/single supply voltage

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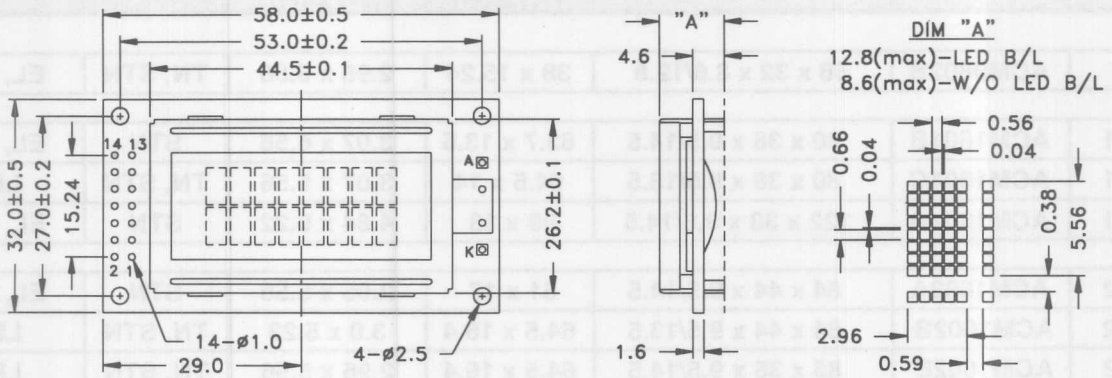
CHARACTER MODULE LIST

PAGE	FORMAT	MODEL NUMBER	OUTLINE DIMENSION (W) x (H) x (D)	VIEWING AREA (W) x (H)	CHARACTER SIZE (W) x (H)	LC FLUID OPTIONS	BACKLIGHT OPTIONS
4	8 x 2	ACM0802B	58 x 32 x 8.6/12.8	38 x 15.24	2.96 x 5.56	TN, STN	EL, LED
4	16 x 1	ACM1601B	80 x 36 x 9.5/14.5	63.7 x 13.5	3.07 x 6.56	STN	EL, LED
5	16 x 1	ACM1601C	80 x 36 x 9.5/13.5	64.5 x 14	3.07 x 6.56	TN, STN	LED
5	16 x 1	ACM1601D	122 x 33 x 9.5/14.5	99 x 13	4.84 x 9.22	STN	EL, LED
6	16 x 2	ACM1602A	84 x 44 x 9.5/14.5	61 x 17	2.95 x 5.55	STN	EL, LED
6	16 x 2	ACM1602B	84 x 44 x 9.5/13.5	64.5 x 16.4	3.0 x 5.23	TN, STN	LED
7	16 x 2	ACM1602E	85 x 36 x 9.5/14.5	64.5 x 16.4	2.96 x 5.56	TN, STN	LED
7	16 x 2	ACM1602K	80 x 36 x 9.5/13.5	64.5 x 16.4	3.0 x 5.23	TN, STN	LED
8	16 x 2	ACM1602L	80 x 36 x 9.5/14.5	65.6 x 13.8	2.95 x 4.89	STN	EL, LED
8	16 x 2	ACM1602M	85 x 30 x 13	62 x 16	2.78 x 4.89	STN	EL, LED
9	16 x 2	ACM1602N	85 x 29.5 x 9.5/13.5	64.5 x 16.4	3.0 x 5.23	TN, STN	LED
9	16 x 2	ACM1602R	122 x 44 x 9.5/14.5	99 x 24	4.84 x 9.66	TN, STN	EL, LED
10	16 x 2	ACM1602S	122 x 44 x 9.5/13.5	99 x 24	5.20 x 9.55	TN, STN	LED
10	16 x 2	ACM1602T	85 x 32.6 x 9.5/13.5	64.5 x 16.4	3.0 x 5.23	TN, STN	LED
11	16 x 2	ACM1602V	106 x 52 x 9.5/13.5	99 x 24	4.84 x 9.22	TN, STN	LED
11	16 x 2	ACM1602W	71.5 x 36 x 9.5/14.5	62 x 16	2.78 x 4.89	STN	EL, LED
12	16 x 4	ACM1604B	87 x 60 x 9.5/14.5	62.4 x 25.2	2.95 x 4.75	STN	EL, LED
12	16 x 4	ACM1604C	87 x 60 x 9.5/13.5	61.8 x 25.2	2.95 x 4.75	TN, STN	LED
13	20 x 2	ACM2002C	116 x 37 x 9.5/15	83 x 18.6	3.20 x 5.55	STN	EL, LED
13	20 x 2	ACM2002D	116 x 37 x 9.5/13.5	83 x 18.6	3.20 x 5.55	TN, STN	LED
14	20 x 2	ACM2002P	180 x 40 x 9.5/14.5	156.2 x 35.2	9.66 x 6.0	TN, STN	EL, LED
14	20 x 4	ACM2004C	98 x 60 x 9.5/14.5	76 x 25.2	2.95 x 4.75	STN	EL, LED
15	20 x 4	ACM2004D	98 x 60 x 9.5/14	76 x 25.2	2.95 x 4.75	TN, STN	LED
15	24 x 2	ACM2402B	118 x 36 x 9.5/14.5	94 x 16.5	3.20 x 5.55	STN	EL, LED
16	24 x 2	ACM2402C	118 x 36 x 9.5/14	94 x 17.8	3.20 x 5.55	TN, STN	LED
16	24 x 2	ACM2402D	190 x 42 x 9.5/14.5	178 x 23	6.00 x 9.63	STN	EL, LED
17	40 x 1	ACM4001A	182 x 33.5 x 9.5/14.5	152.5 x 16.5	3.20 x 5.95	STN	EL, LED
17	40 x 2	ACM4002D	182 x 33.5 x 9.5/14	154.5 x 16.5	3.20 x 5.55	TN, STN	LED
18	40 x 2	ACM4002F	182 x 33.5 x 9.5/14.5	154.1 x 16.5	3.20 x 5.55	STN	LED
18	40 x 4	ACM4004C	190 x 54 x 9.5/14.5	147 x 29.5	2.78 x 4.89	STN	EL, LED

ALL DIMENSIONS IN MILLIMETERS

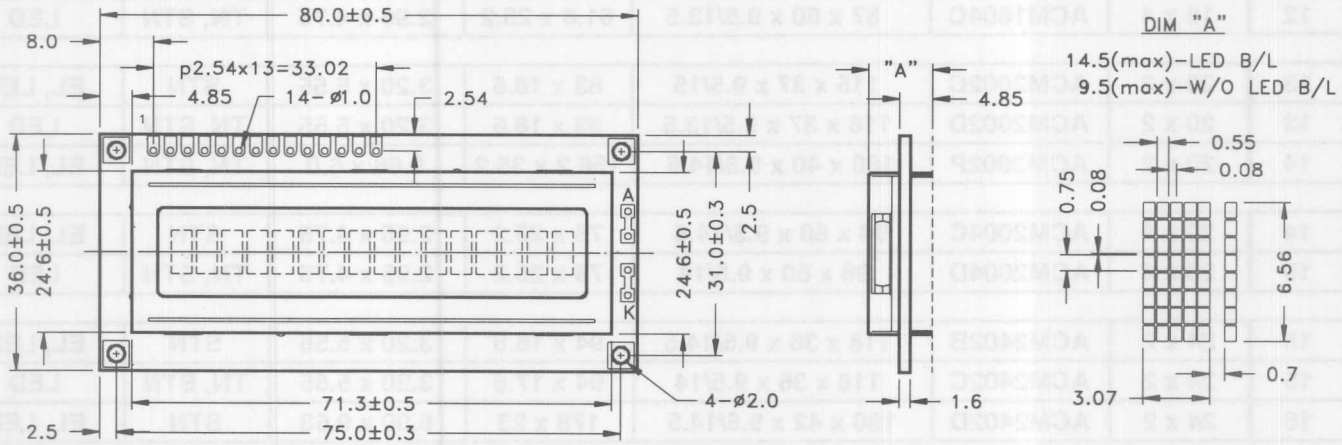
ACM 0802B SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 1601B SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0076/KS0066

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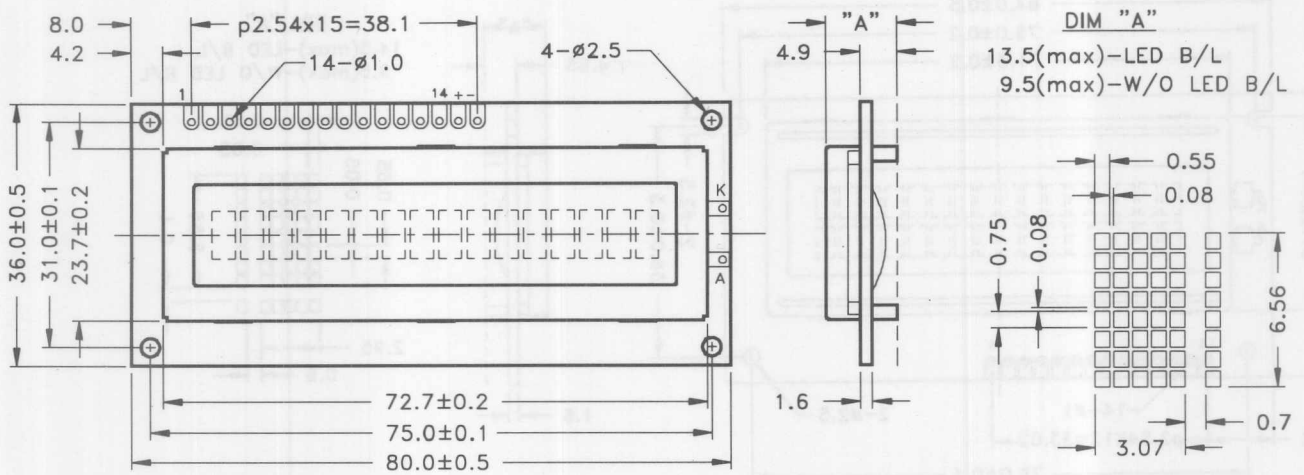
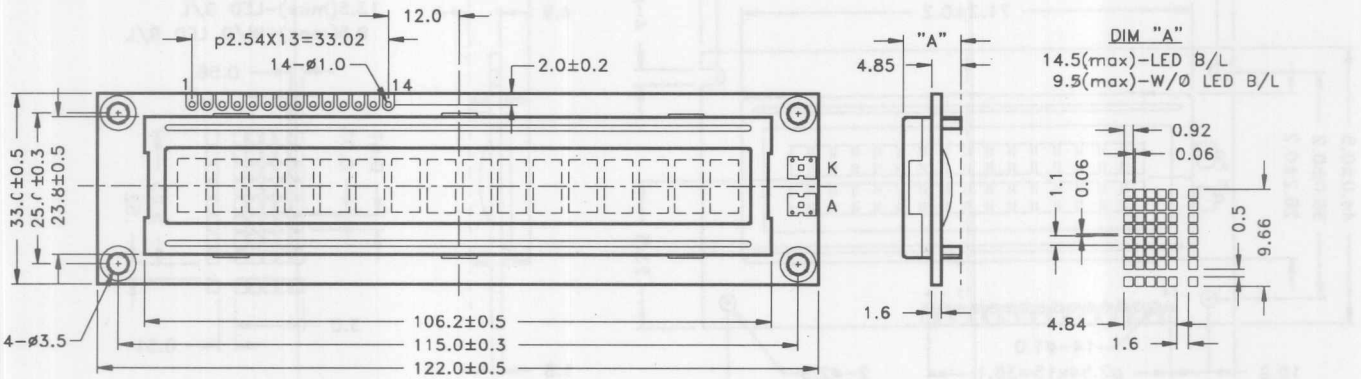
ACM 1601C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard
Controller:	KS0066

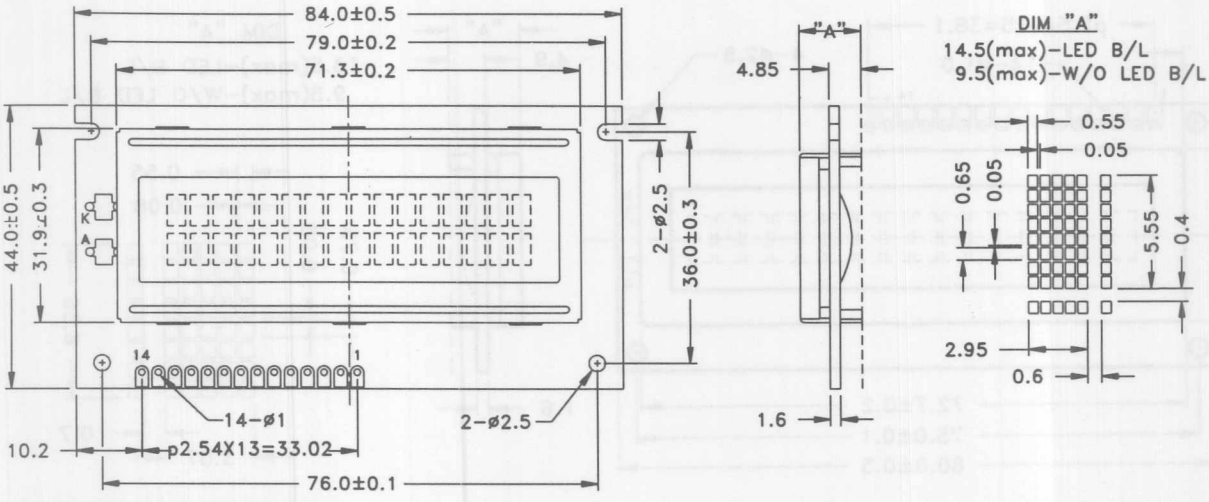
ACM 1601D SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	K	LED -
8	DB1	A	LED +

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED, EL
Temperature Range:	Standard, Wide
Controller:	MSM6222B

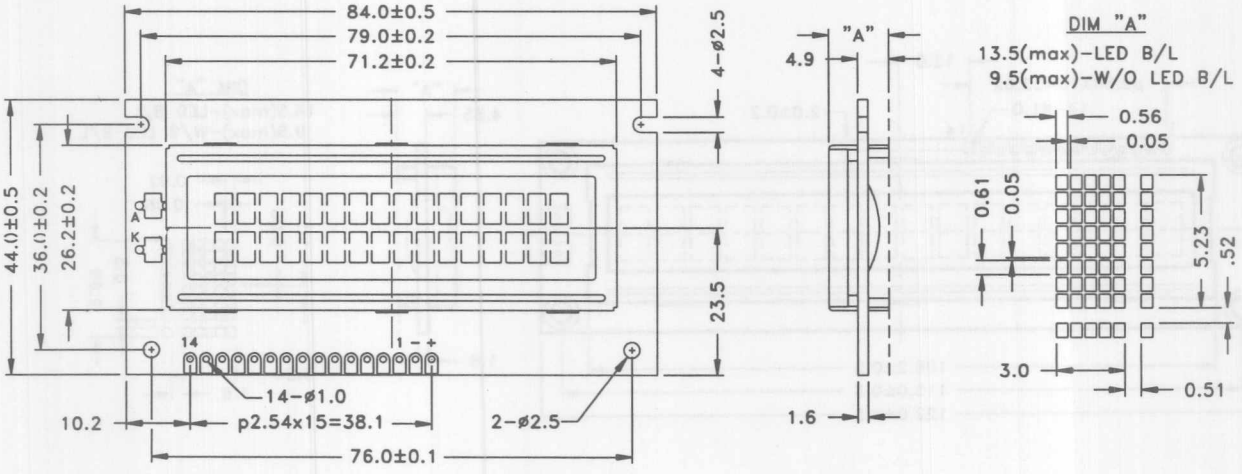
ACM 1602A SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0076/KS0066

ACM 1602B SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	+	LED +
8	DB1	-	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN,STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

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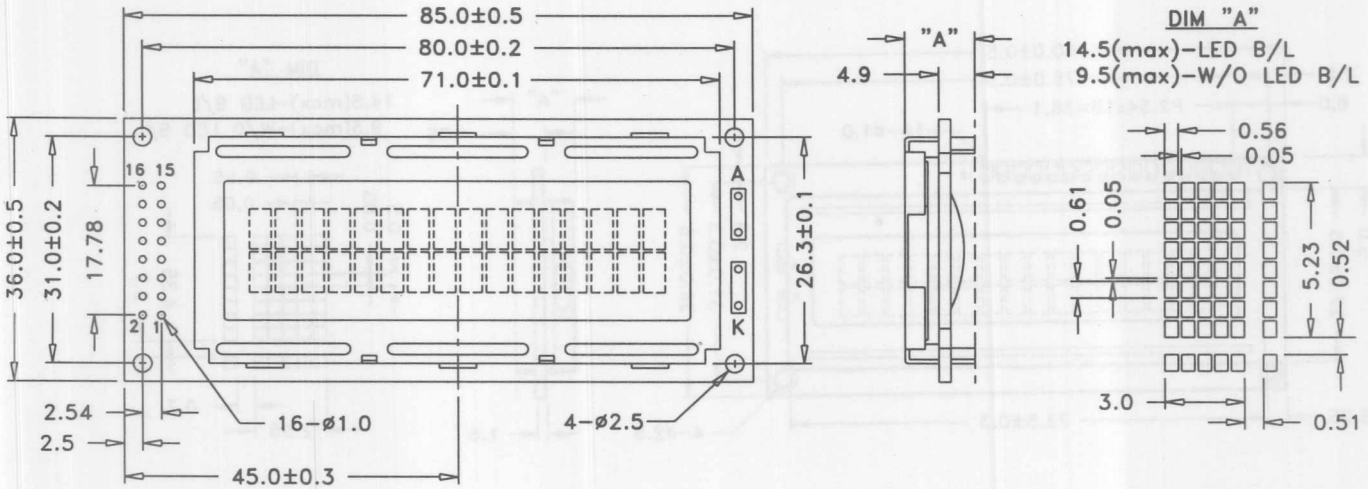
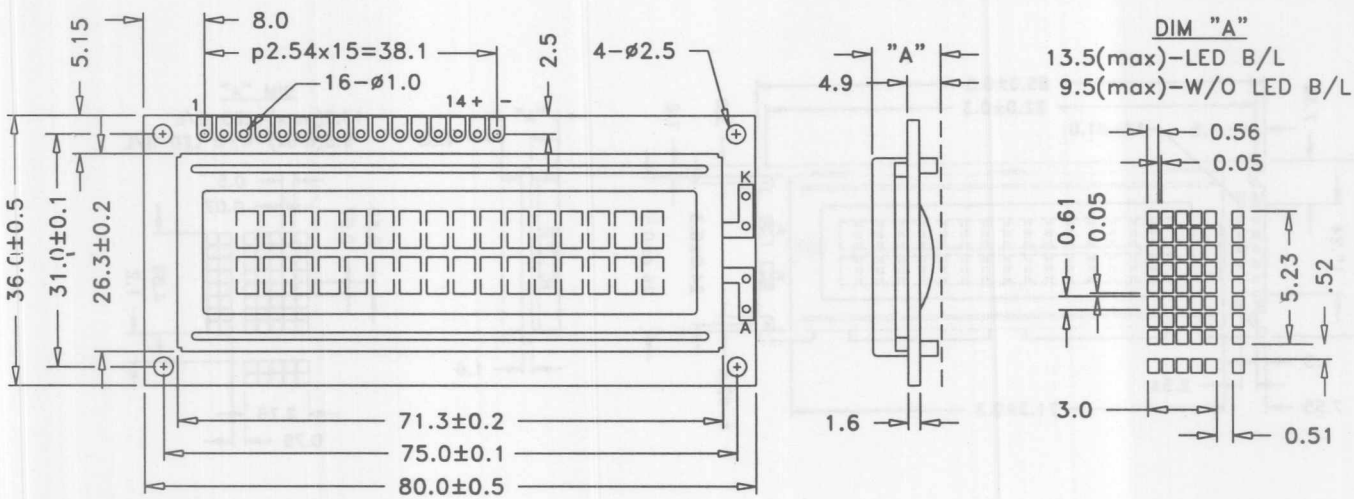
ACM 1602E SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 1602K SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

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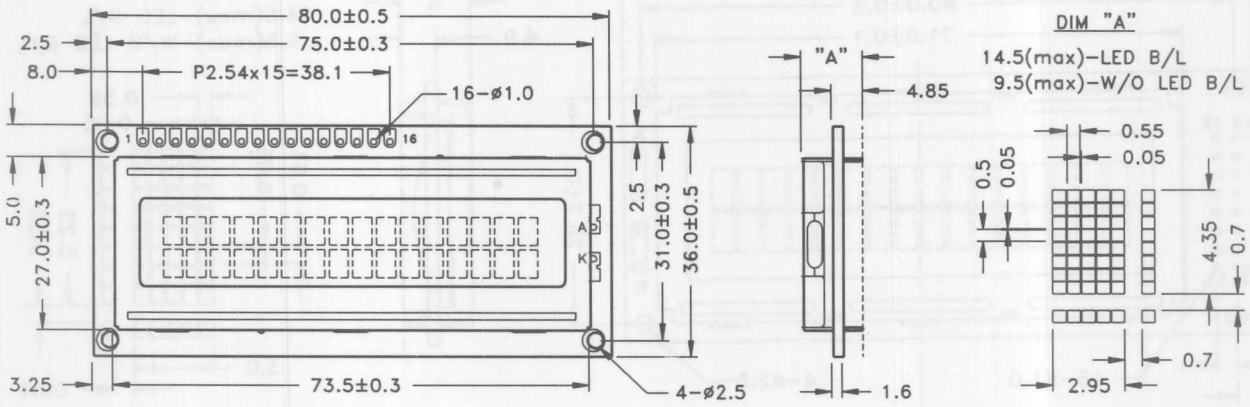
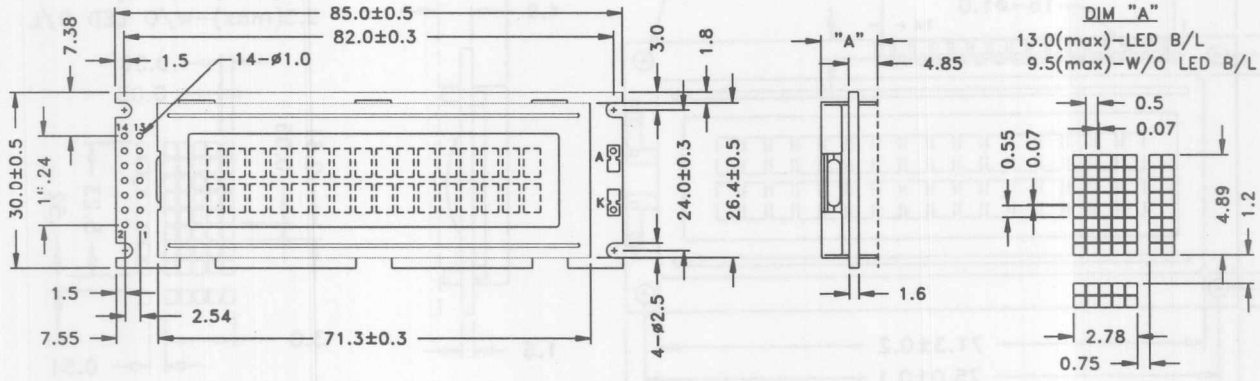
ACM 1602L SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0076

ACM 1602M SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vdd	9	DB2
2	Vss	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0076

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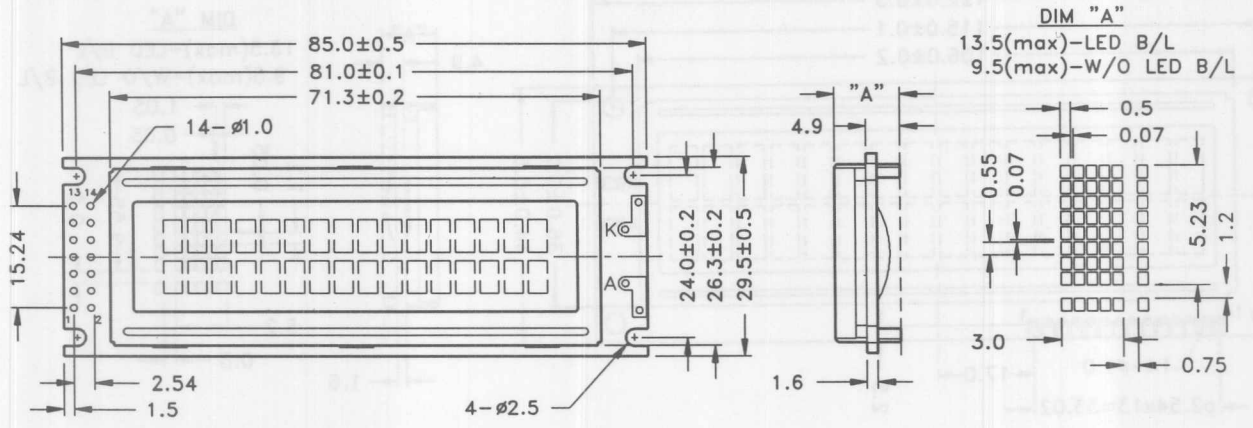
ACM 1602N SERIES



PIN	SIGNAL	PIN	SIGNAL
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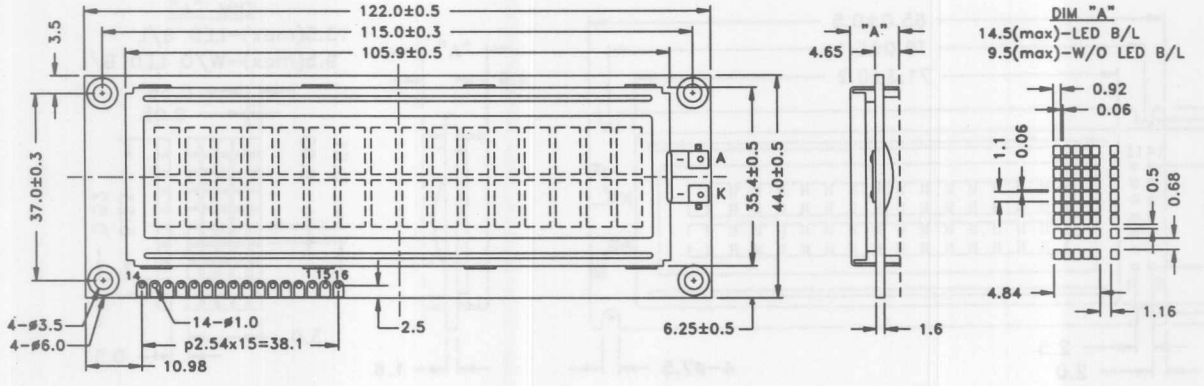
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	K	LED -
8	DB1	A	LED +

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 1602R SERIES



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1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0066/KS0076

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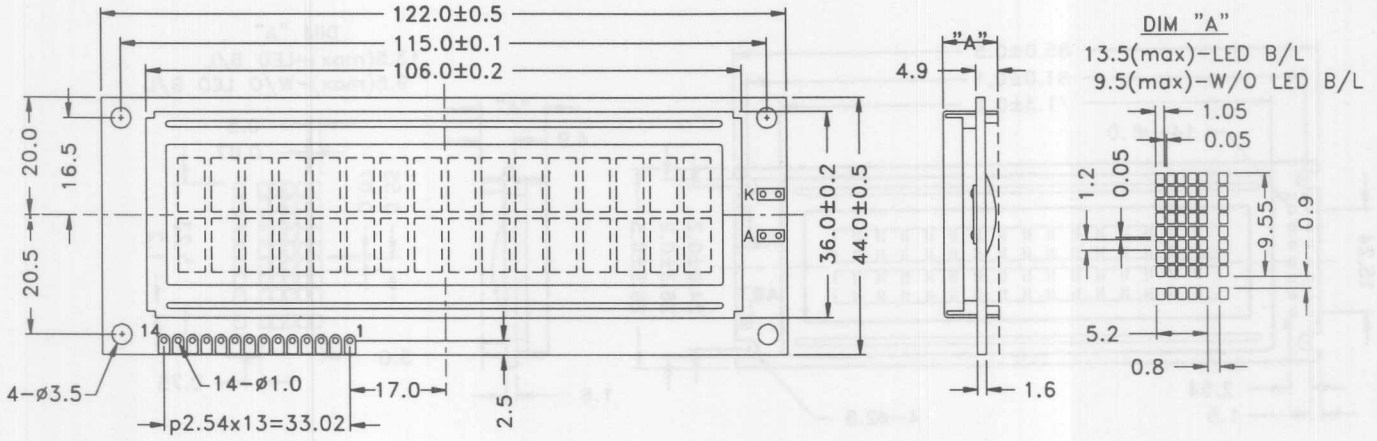
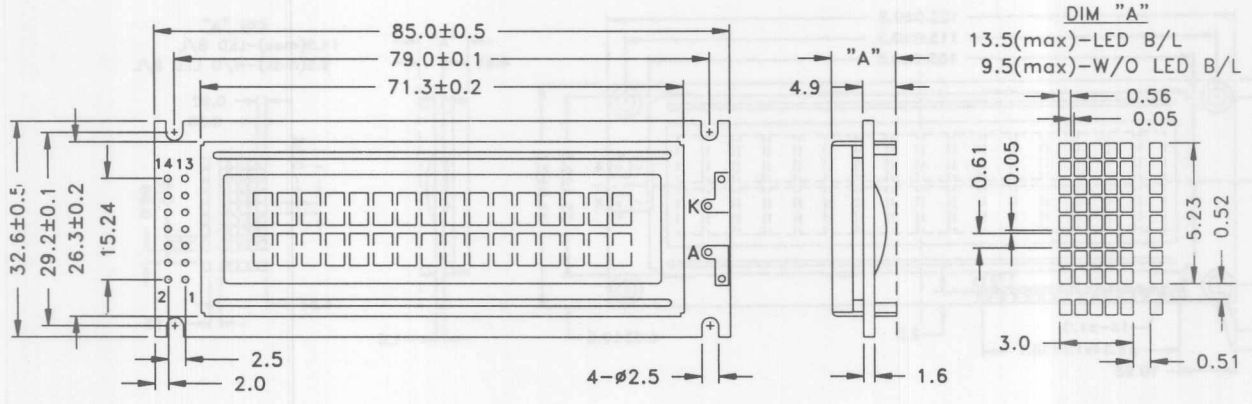
ACM 1602S SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	K	LED +
8	DB1	A	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 1602T SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	K	LED +
8	DB1	A	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN,STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

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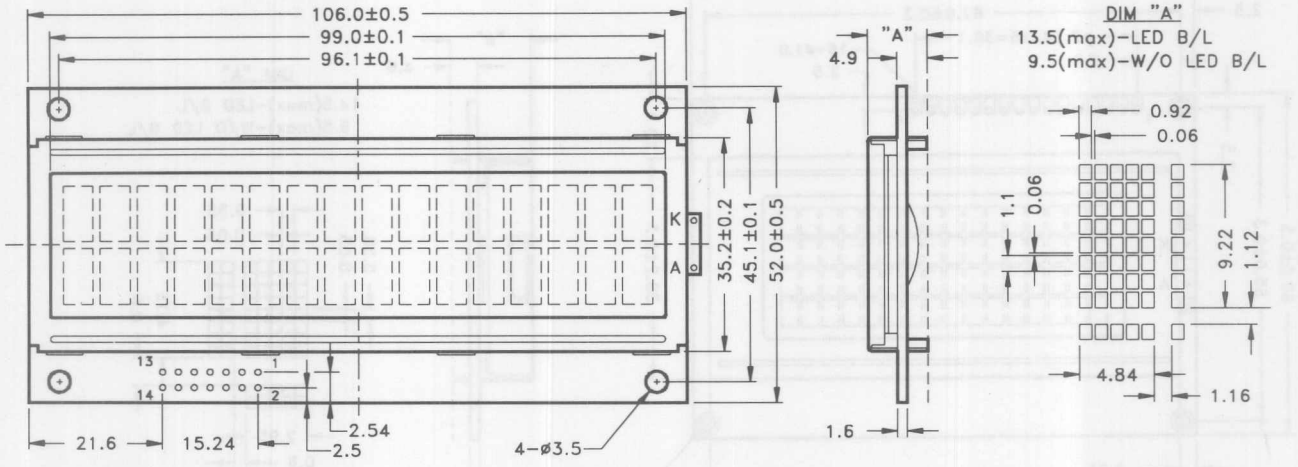
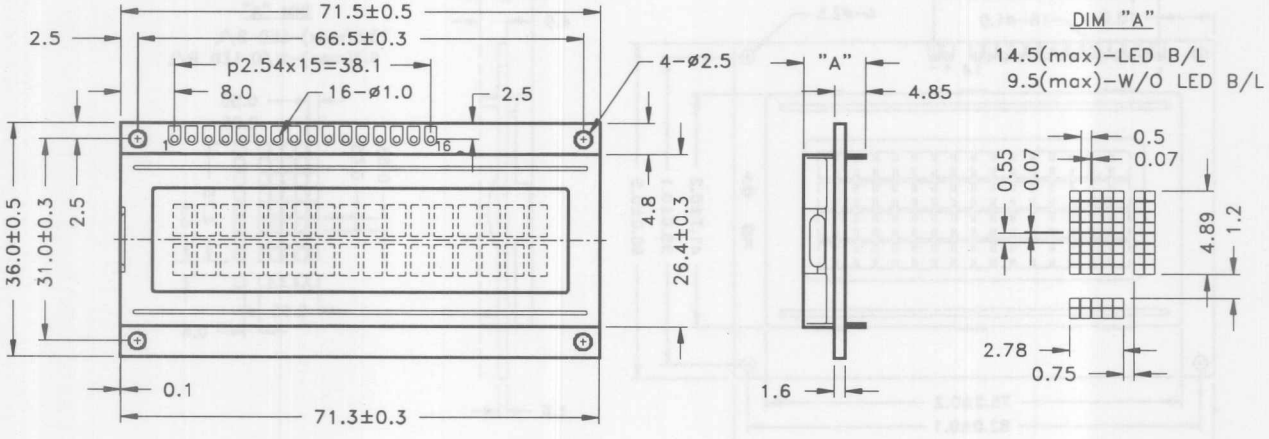
ACM 1602V SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	K	LED +
8	DB1	A	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN,STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 1602W SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066,KS0076

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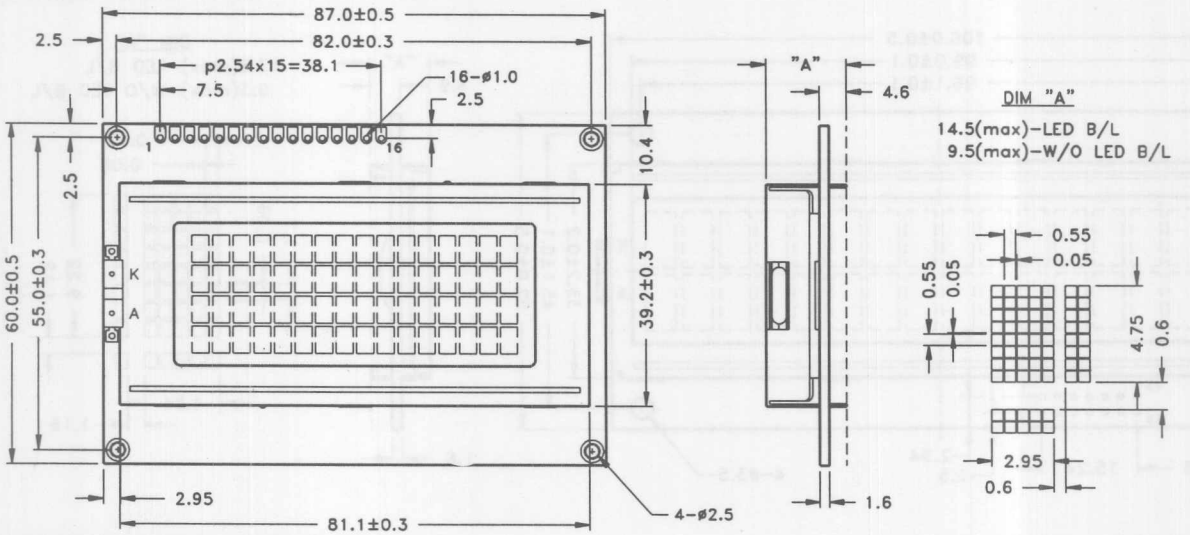
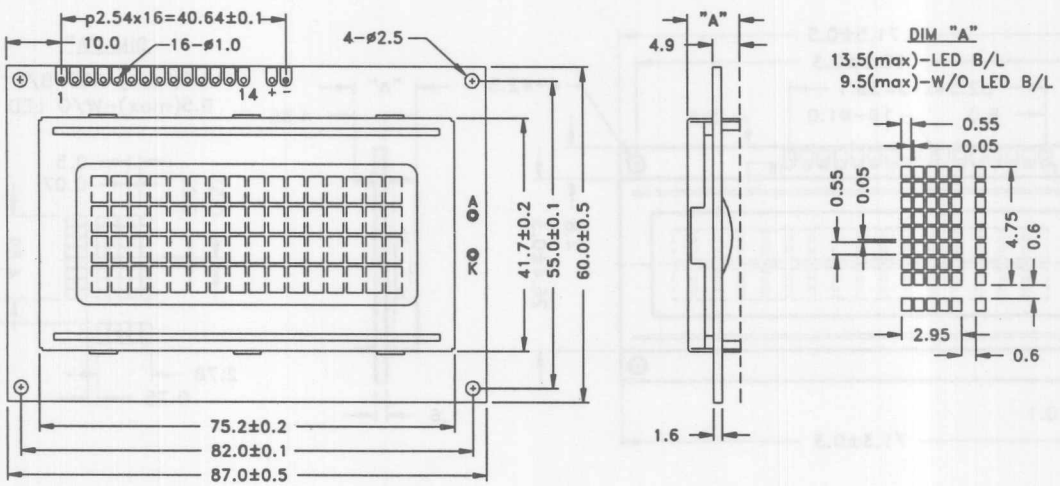
ACM 1604B SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	MSM6222B/KS0066

ACM 1604C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	+	LED +
8	DB1	-	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

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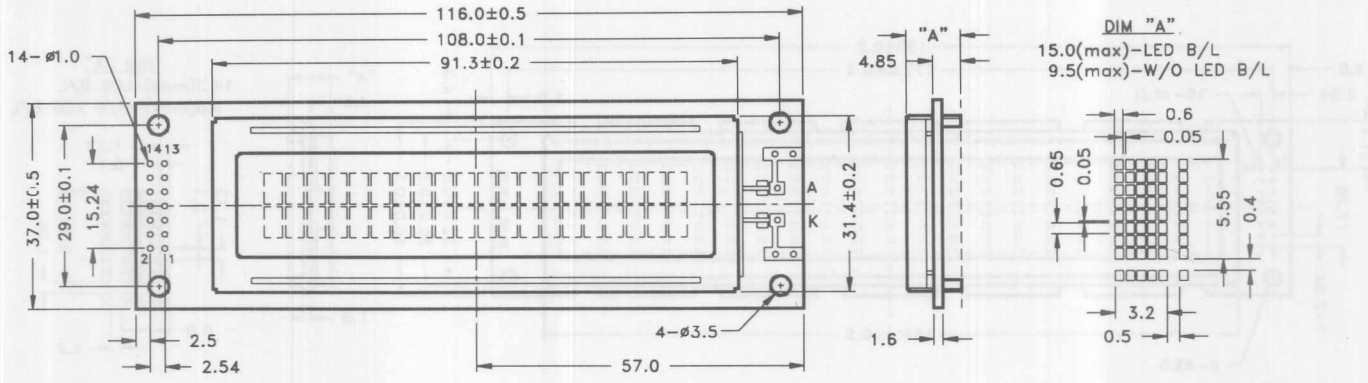
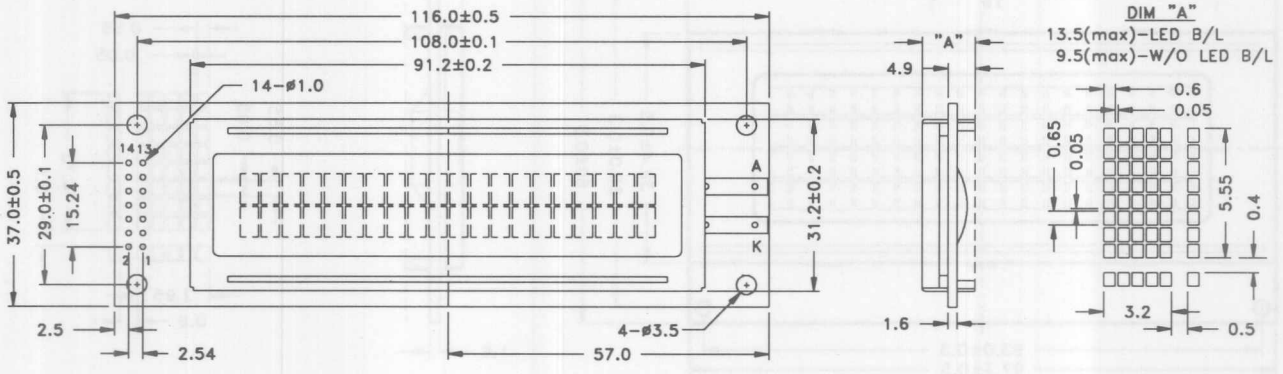
ACM 2002C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0066/ KS0076

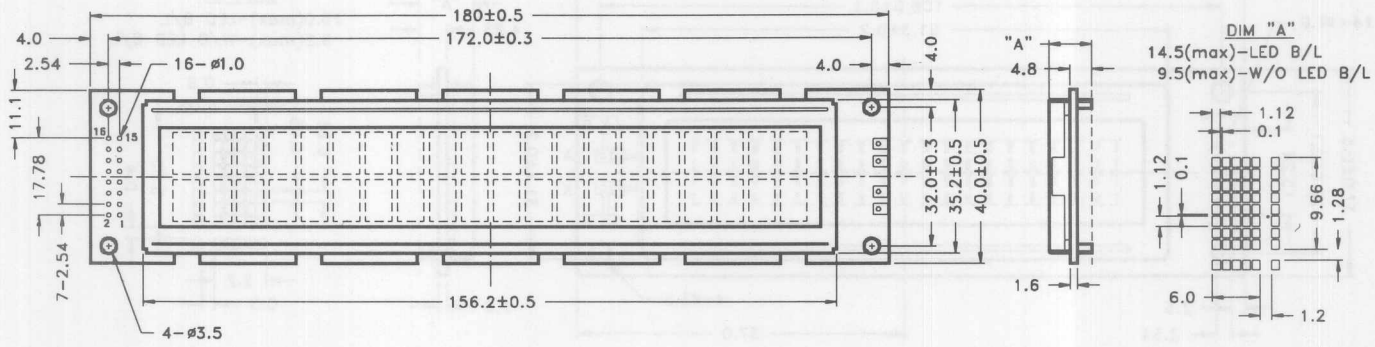
ACM 2002D SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066

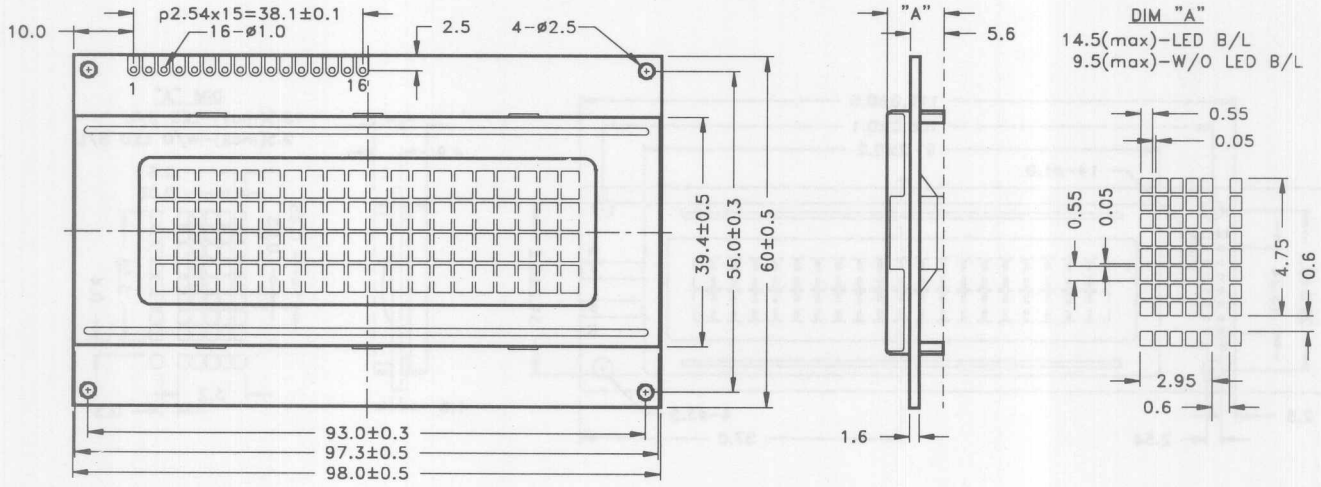
ACM 2002P SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0066

ACM 2004C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0070B/MSM6222

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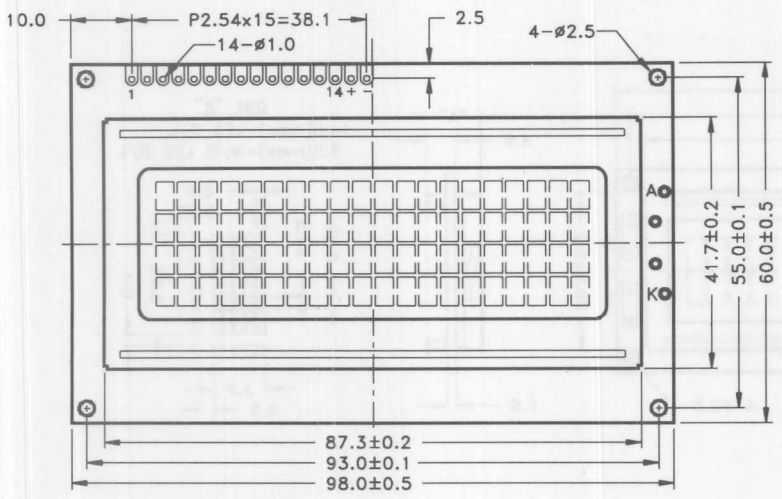
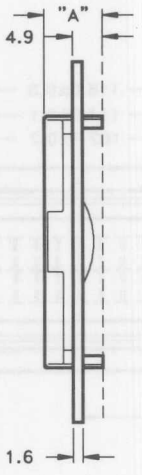
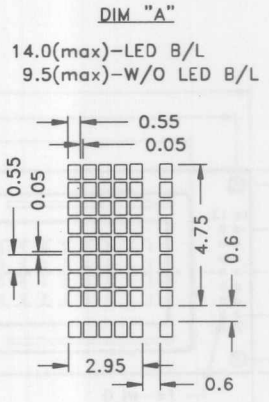
ACM 2004D SERIES



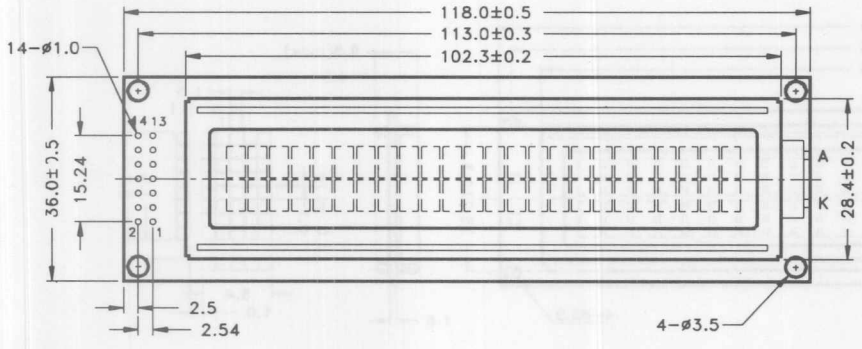


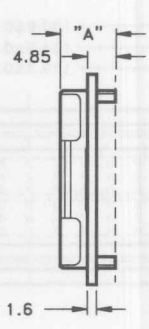


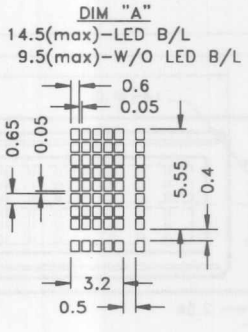
PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	+	LED +
8	DB1	-	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard
Controller:	KS0066

ACM 2402B SERIES



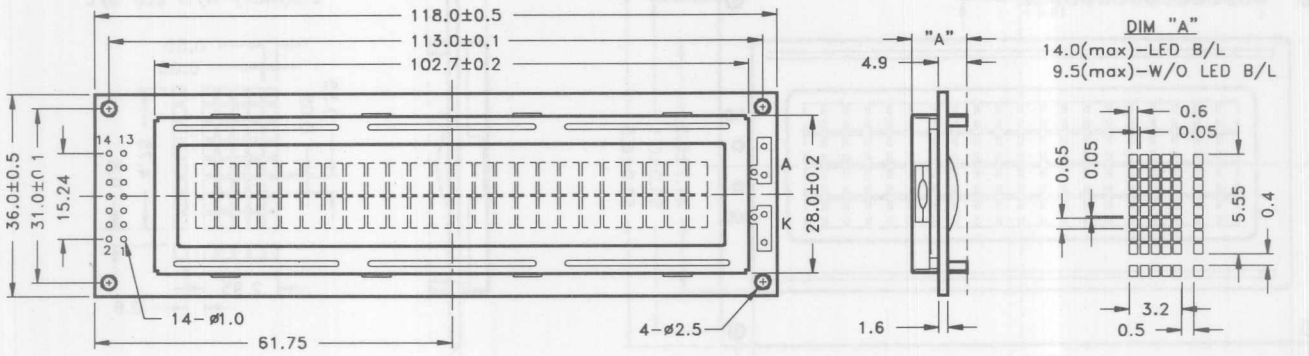




PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0066/KS0076

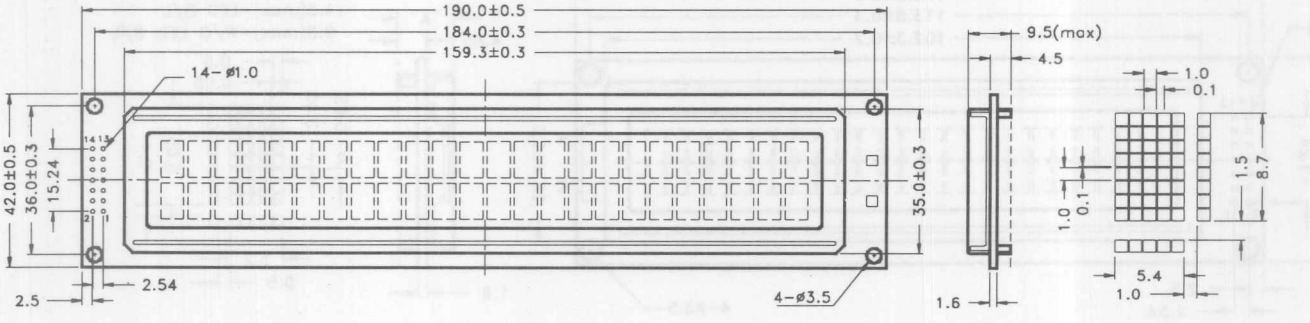
ACM 2402C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard
Controller:	KS0066

ACM 2402D SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	8	DB1
2	Vdd	9	DB2
3	Vo	10	DB3
4	RS	11	DB4
5	R/W	12	DB5
6	E	13	DB6
7	DB0	14	DB7

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective
Backlight:	LED
Temperature Range:	Standard
Controller:	KS0066

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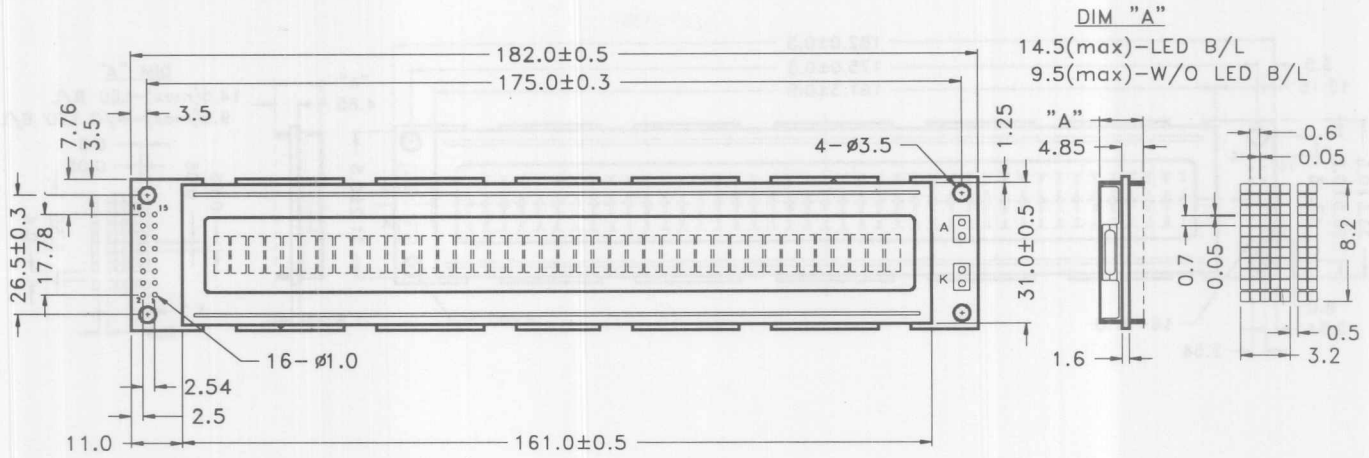
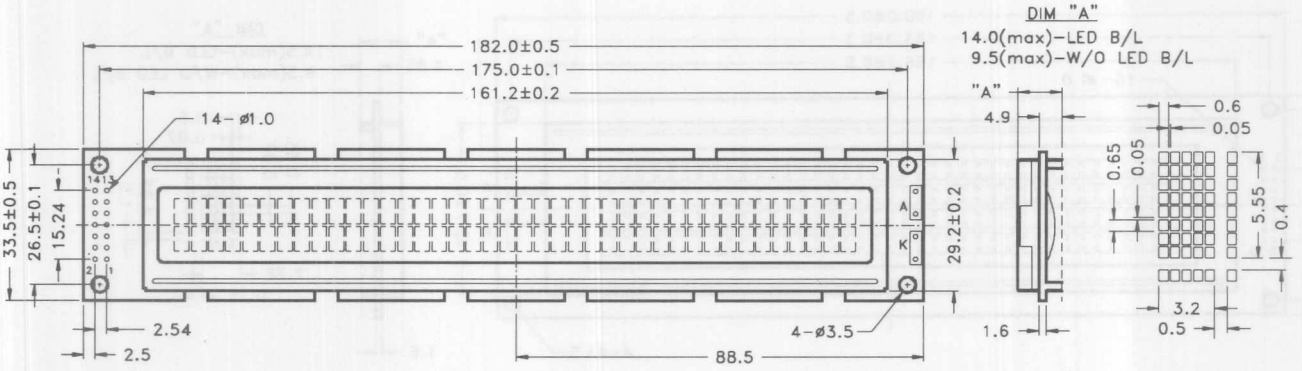
ACM 4001A SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
Controller:	KS0066/KS0076

ACM 4002D SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED +
8	DB1	K	LED -

PERFORMANCE FEATURES	
LC Fluid:	TN, STN (gray, yellow)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED, EL
Temperature Range:	Standard, Wide
Controller:	KS0066

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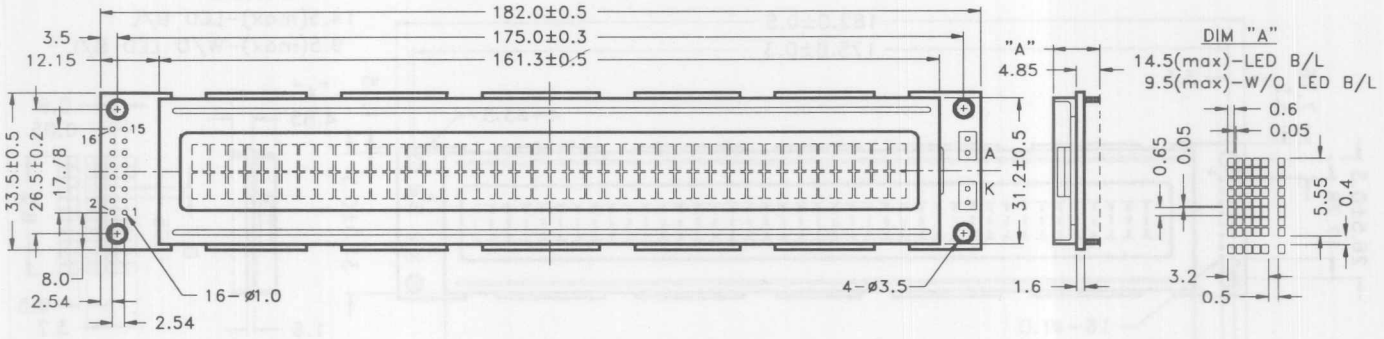
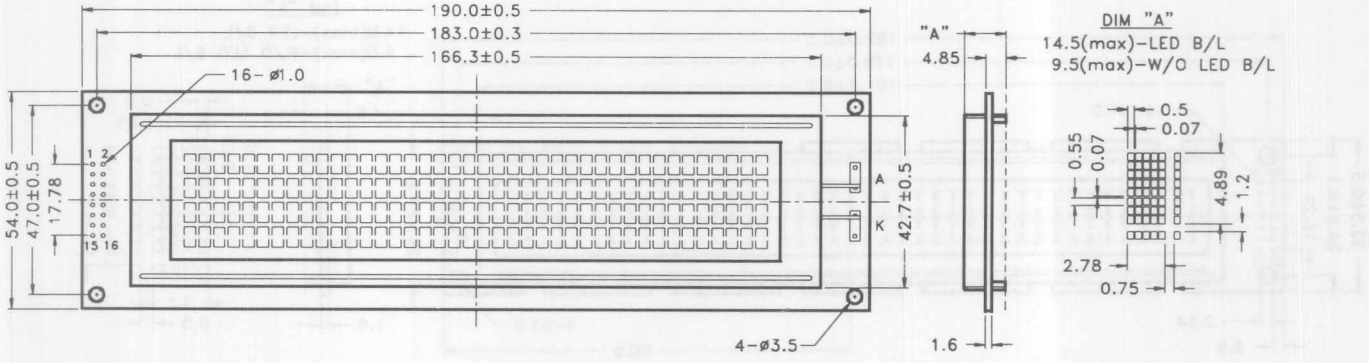
ACM 4002F SERIES



PIN	SIGNAL	PIN	SIGNAL
1	Vss	9	DB2
2	Vdd	10	DB3
3	Vo	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED +
8	DB1	16	LED -

PERFORMANCE FEATURES	
Lc Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	KS0076

ACM 4004C SERIES



PIN	SIGNAL	PIN	SIGNAL
1	DB7	10	R/W
2	DB6	11	RS
3	DB5	12	VO
4	DB4	13	Vss
5	DB3	14	Vdd
6	DB2	15	E2
7	DB1	16	NC
8	DB0	A	LED +
9	E1	K	LED -

PERFORMANCE FEATURES	
Lc Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
Controller:	HD44780

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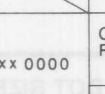
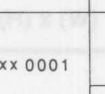
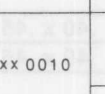
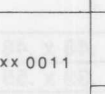
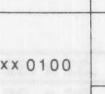
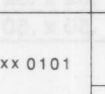
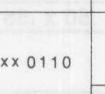
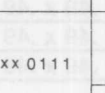
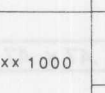
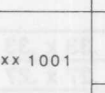
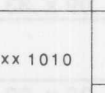
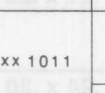
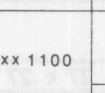
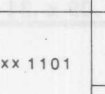
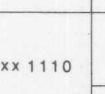
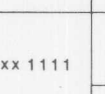
STANDARD CHARACTER PATTERNS

Lower 4bit \ Higher 4bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx 0000	CG RAM (1)												
xxxx 0001	(2)												
xxxx 0010	(3)												
xxxx 0011	(4)												
xxxx 0100	(5)												
xxxx 0101	(6)												
xxxx 0110	(7)												
xxxx 0111	(8)												
xxxx 1000	(1)												
xxxx 1001	(2)												
xxxx 1010	(3)												
xxxx 1011	(4)												
xxxx 1100	(5)												
xxxx 1101	(6)												
xxxx 1110	(7)												
xxxx 1111	(8)												

Note: The character generator RAM is the RAM with which the user can rewrite character patterns by program.

GRAPHIC MODULE LIST

PAGE	DOT FORMAT	MODEL NUMBER	OUTLINE DIMENSION (W) x (H) x (D)	VIEWING AREA (W) x (H)	DOT SIZE (W) x (H)	DOT PITCH (W) x (H)
22	122 x 32	AGM1232C	65.8 x 27.1 x 8.4	60.5 x 18.5	.40 x .45	.44 x .49
23	122 x 32	AGM1232D	84.0 x 44.0 x 9.0/13.0	60.0 x 18.0	.40 x .45	.44 x .49
24	128 x 64	AGM1264B	93.0 x 70.0 x 8.5/14.0	70.7 x 38.8	.48 x .48	.52 x .52
25	128 x 64	AGM1264D	78.0 x 70.0 x 9.3/13.0	62.0 x 44.0	.39 x .55	.44 x .60
26	128 x 128	AGM1212B	72.4 x 69.9 x 9.5/13.5	49.0 x 49.0	.32 x .32	.35 x .35
27	128 x 128	AGM1212C	72.4 x 69.9 x 9.5/13.5	49.0 x 49.0	.32 x .32	.35 x .35
28	128 x 128	AGM1212D	92.0 x106.0 x 12.0/14.5	73.0 x 73.0	.50 x .50	.55 x .55
29	150 x 32	AGM1532A	116.5 x 42.0 x 9.5/15.5	87.6 x 24.0	.50 x .55	.55 x .60
30	240 x 64	AGM2464C	180.0 x 65.0 x 9.5/14.5	133.0 x 39.0	.49 x .49	.53 x .53
31	240 x 64	AGM2464D	180.0 x 65.0 x 10.5/15.5	133.0 x 39.0	.49 x .49	.53 x .53
32	240 x 64	AGM2464D	180.0 x 65.0 x 13.8	133.0 x 39.0	.49 x .49	.53 x .53
33	240 x 128	AGM2412B	170.0 x 101.7 x 14.0	132.0 x 76.0	.47 x .47	.50 x .50
34	320 x 240	AGM3224D	167.1 x 109.0 x 11.0	122.0 x 92.0	.33 x .33	.36 x .36
35	320 x 240	AGM3224E	134.5 x 117.0 x 14.0	103.0 x 79.0	.27 x .27	.30 x .30
39	320 x 240	AGM3224W*	168.0 x 111.0 x 6.4	120.0 x 90.0	.09 x .33	.09 x.36
36	480 x 320	AGM4832B	148.2 x 101.5 x 6.0	118.6 x 80.0	.22 x .22	.24 x .24
37	640 x 200	AGM6420A	210.6 x 89.9 x 2.3	183.0 x 70.2	.24 x .30	.27 x .33
38	640 x 480	AGM6448C	260.0 x 174.0 x 8.0	202.4 x 153.4	.27 x .27	.30 x .30
40	640 x 480	AGM6448V*	260.0 x 174.0 x 8.0	216.0 x 161.6	.09 x .31	.11 x .33

ALL DIMENSIONS IN MILLIMETERS
*Color Modules

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GRAPHIC MODULE LIST

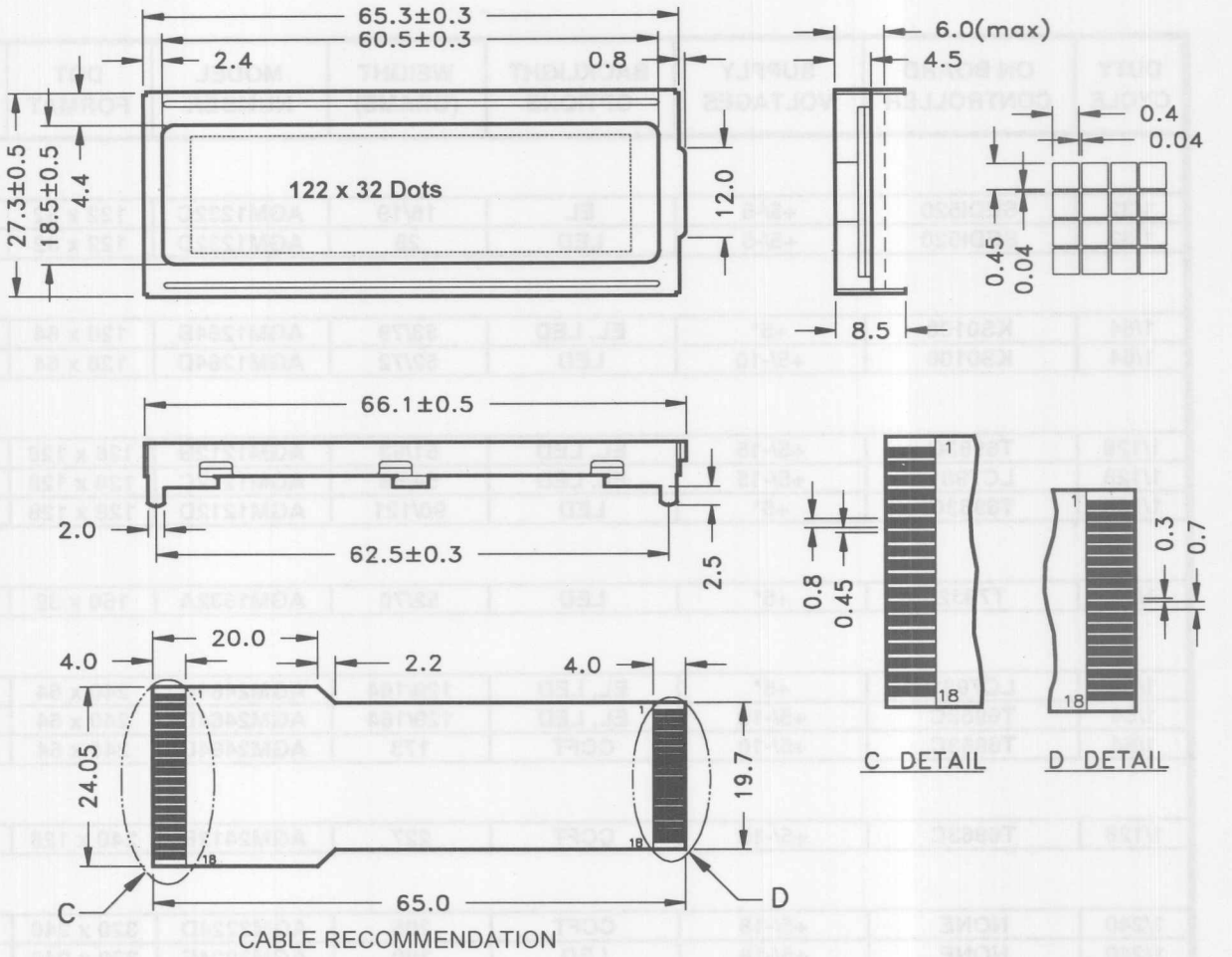
DUTY CYCLE	ON BOARD CONTROLLER	SUPPLY VOLTAGES	BACKLIGHT OPTIONS	WEIGHT (GRAMS)	MODEL NUMBER	DOT FORMAT	PAGE
1/32	SEDI520	+5/-5	EL	18/19	AGM1232C	122 x 32	22
1/32	SEDI520	+5/-5	LED	28	AGM1232D	122 x 32	23
1/64	KS0108	+5*	EL, LED	53/79	AGM1264B	128 x 64	24
1/64	KS0108	+5/-10	LED	52/72	AGM1264D	128 x 64	25
1/128	T6963C	+5/-15	EL, LED	51/63	AGM1212B	128 x 128	26
1/128	LC7981	+5/-15	EL, LED	54/68	AGM1212C	128 x 128	27
1/128	T6963C	+5*	LED	90/121	AGM1212D	128 x 128	28
1/32	T7932	+5*	LED	52/70	AGM1532A	150 x 32	29
1/64	LC7981	+5*	EL, LED	129/164	AGM2464C	240 x 64	30
1/64	T6963C	+5/-10	EL, LED	129/164	AGM2464D	240 x 64	31
1/64	T6963C	+5/-10	CCFT	173	AGM2464D	240 x 64	32
1/128	T6963C	+5/-15	CCFT	227	AGM2412B	240 x 128	33
1/240	NONE	+5/-18	CCFT	205	AGM3224D	320 x 240	34
1/240	NONE	+5/-18	LED	190	AGM3224E	320 x 240	35
1/240	NONE	+5/30	CCFT	280	AGM3224W	320 x 240	39
1/320	NONE	+5/+33	NONE	56	AGM4832B	480 x 320	36
1/200	NONE	+5/-18	NONE	102	AGM6420A	640 x 200	37
1/240	NONE	+5+30	CCFT	495	AGM6448V	640 x 480	38
1/240	NONE	+5/-18	CCFT	354	AGM6448C	640 x 480	40

+5* = NEGATIVE VOLTAGE CIRCUIT INCLUDED ON-BOARD

SED= SMOS
KS= SAMSUNG
T=TOSHIBA
LC= SANYO
HD= Hitachi

LC7981 equivalent HD61830B
KS0108 equivalent HD61202

AGM 1232C SERIES



CABLE RECOMMENDATION

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL
Temperature Range:	Standard, Wide
On-Board Controller:	SED1520

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	A∅	Instruction/Data	10	DB2	Data Bus Line
2	$\overline{CS2}$	Chip Select for IC2	11	DB3	Data Bus Line
3	$\overline{CS1}$	Chip Select for IC1	12	DB4	Data Bus Line
4	CL	External Clock (2KHZ)	13	DB5	Data Bus Line
5	$\overline{RD}$(E)	$\overline{RD}$ For 80 Series, E for 68 Series	14	DB6	Data Bus Line
6	$\overline{WR}$(R/$\overline{W}$)	$\overline{WR}$ For 80 Series, R/$\overline{W}$ For 68 Series	15	DB7	Data Bus Line
7	Vss	Ground	16	Vdd	+5V
8	DB0	Data Bus Line	17	$\overline{RES}$	Reset
9	DB1	Data Bus Line	18	Vee	Power Supply For LCD Driving

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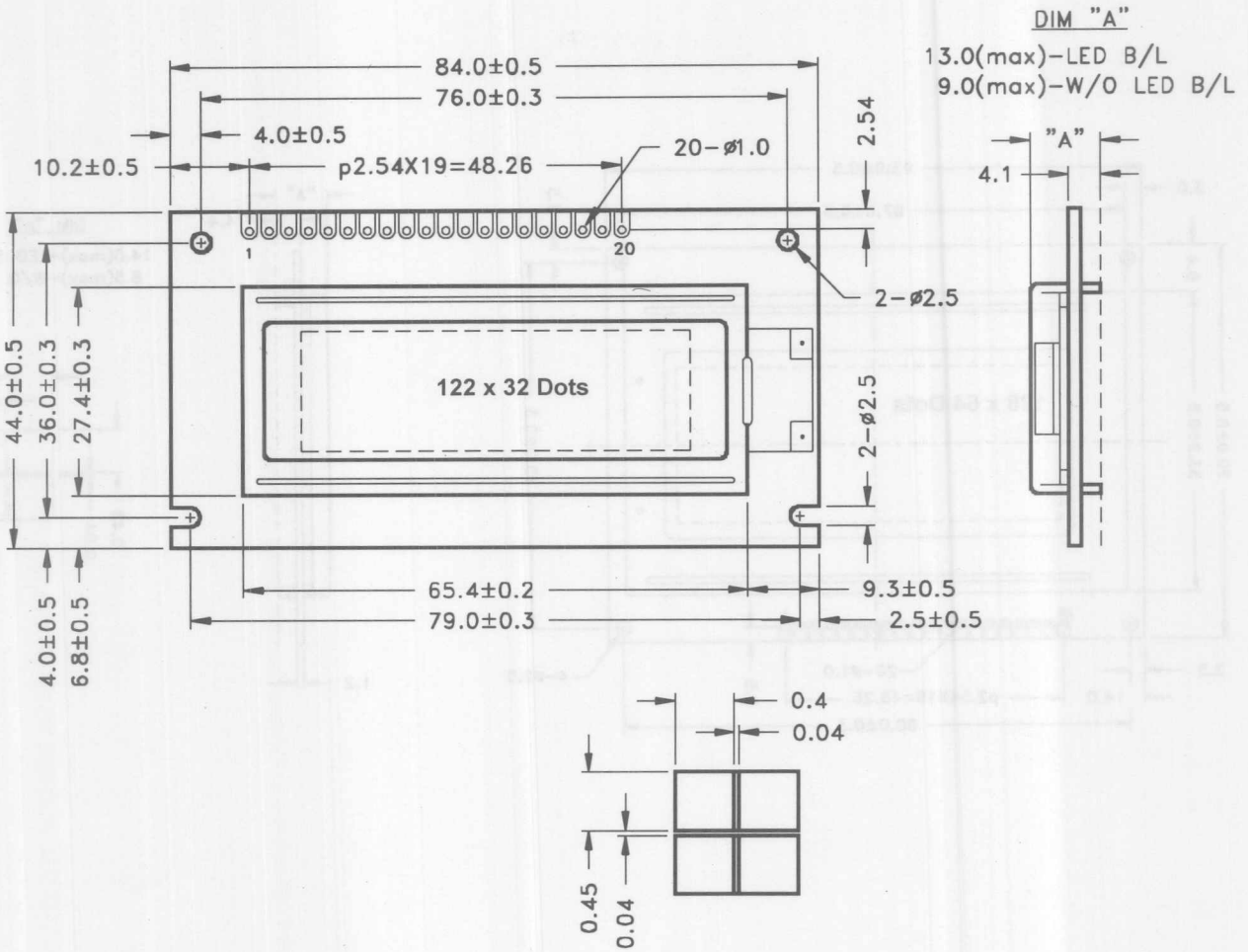
AGM 1232D SERIES



PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
On-Board Controller:	SEDI520

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vss	Ground	11	DB1	Data Bus Line
2	Vdd	Power Supply For Logic Circuit	12	DB2	Data Bus Line
3	Vo	Power Supply For LCD Driving	13	DB3	Data Bus Line
4	AØ	Instruction/Data	14	DB4	Data Bus Line
5	$\overline{CS1}$	Chip Select for IC1	15	DB5	Data Bus Line
6	$\overline{CS2}$	Chip Select for IC2	16	DB6	Data Bus Line
7	CL	External Clock (2KHZ)	17	DB7	Data Bus Line
8	$\overline{RD}$(E)	$\overline{RD}$ For 80 Series, E for 68 Series	18	$\overline{RES}$	Reset
9	$\overline{WR}$(R/$\overline{W}$)	$\overline{WR}$ For 80 Series, R/$\overline{W}$ For 68 Series	19	LED +	Power Supply For LED Backlight
10	DB0	Data Bus Line	20	LED -	Power Supply For LED Backlight

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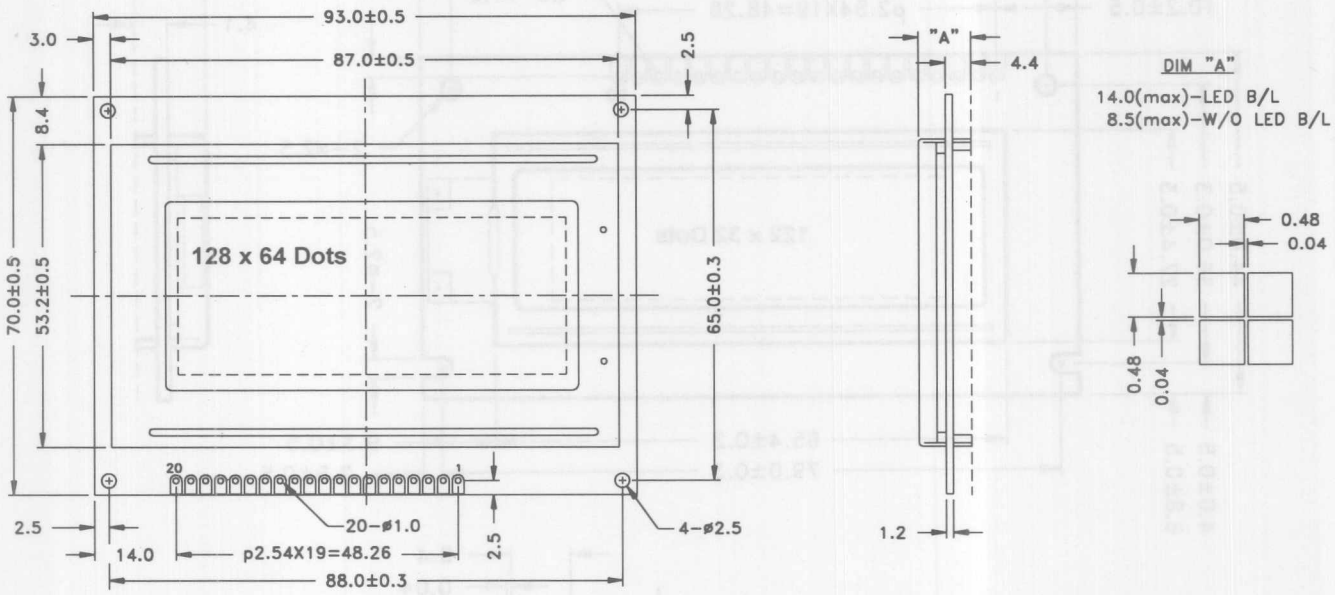
AGM 1264B SERIES



PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
On-Board Controller:	KS0108

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vss	Ground	11	DB4	Data Bus Line
2	Vdd	+5V	12	DB5	Data Bus Line
3	Vo	LCD Contrast Voltage	13	DB6	Data Bus Line
4	D/$\overline{I}$	Data/Instruction	14	DB7	Data Bus Line
5	R/$\overline{W}$	Read/Write	15	CS1	Chip Select for IC1
6	E	Enable	16	CS2	Chip Select for IC2
7	DB0	Data Bus Line	17	$\overline{RES}$	Reset
8	DB1	Data Bus Line	18	Vee	Power Supply for LCD Driving
9	DB2	Data Bus Line	19	K	LED - or EL Backlight
10	DB3	Data Bus Line	20	A	LED + or EL Backlight

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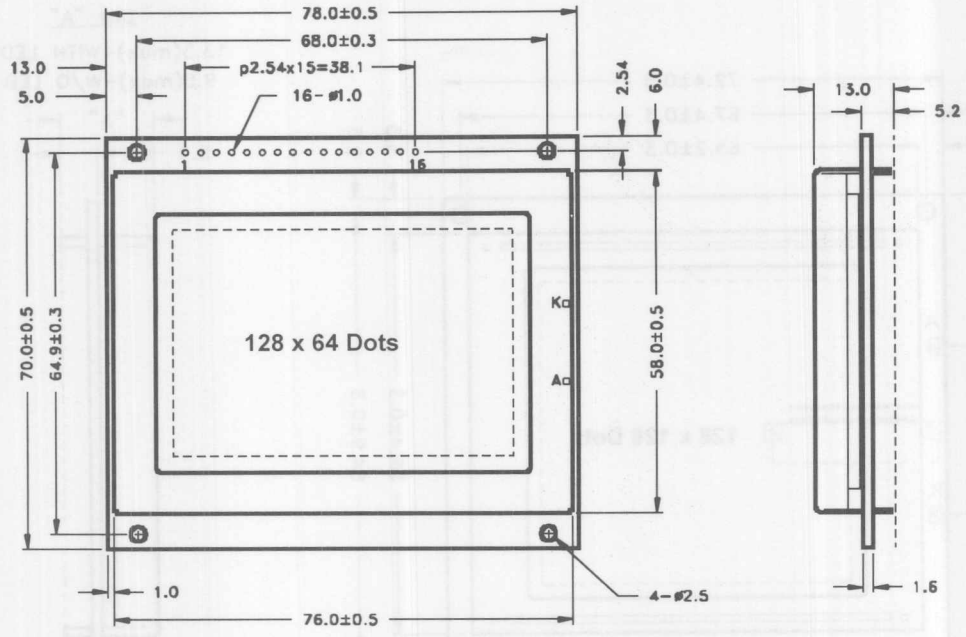
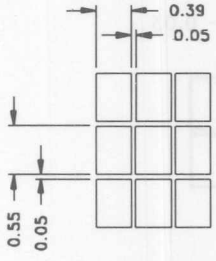
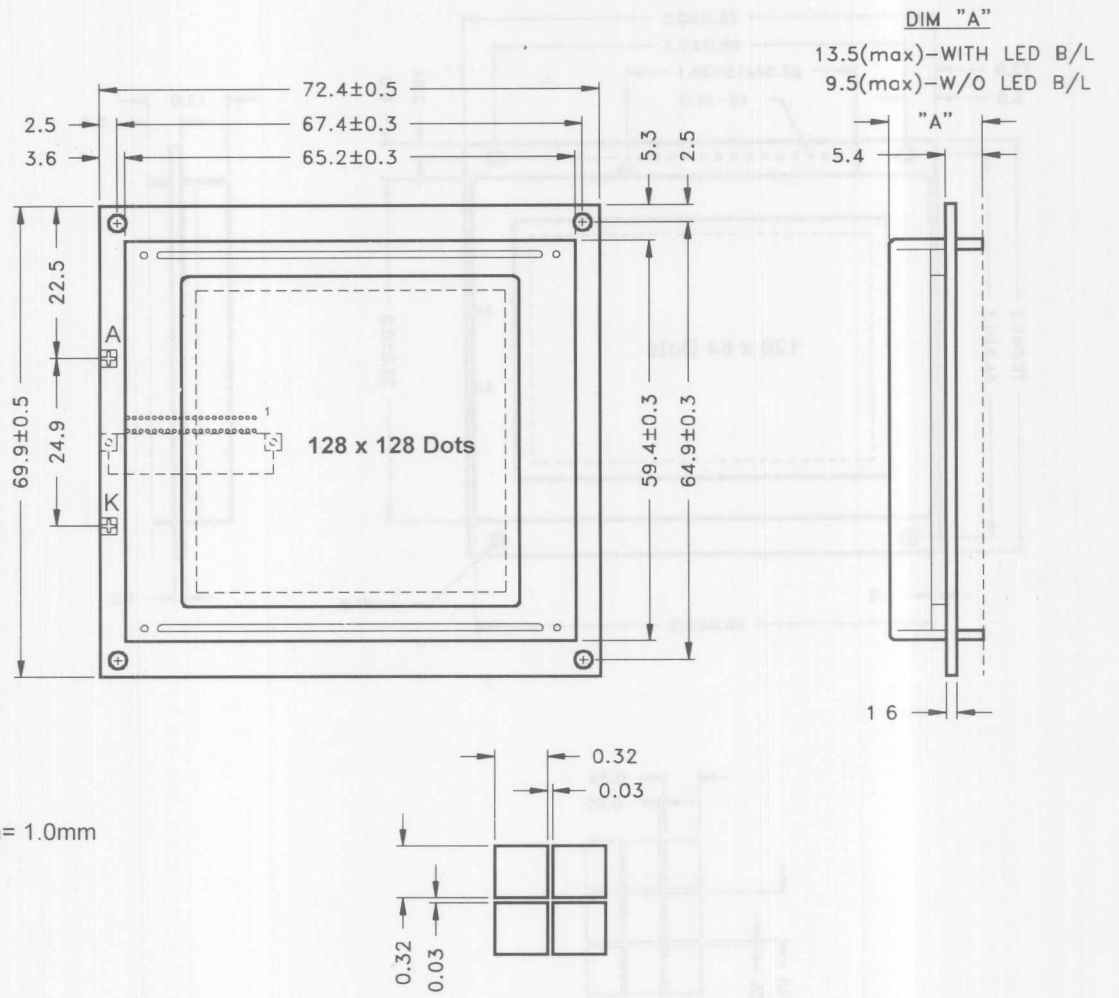




PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
On-Board Controller:	KS0108

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	CS1	Chip Select for IC1	10	DB1	Data Bus Line
2	CS2	Chip Select for IC2	11	DB2	Data Bus Line
3	Vss	Ground	12	DB3	Data Bus Line
4	Vdd	+5V	13	DB4	Data Bus Line
5	Vo	LCD Contrast Voltage	14	DB5	Data Bus Line
6	D/$\overline{I}$	Data/Instruction	15	DB6	Data Bus Line
7	R/$\overline{W}$	Read/Write	16	DB7	Data Bus Line
8	E	Enable	K	LED -	Power Supply For LED B.L.
9	DB0	Data Bus Line	A	LED +	Power Supply For LED B.L.

AGM 1212B SERIES



Pin pitch= 1.0mm

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard, Wide
On-Board Controller:	T6963C

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vss	Ground	11	DB2	Data Bus Line
2	Vdd	+5V	12	DB3	Data Bus Line
3	Vee (Vo)	Power Supply for LCD Driving	13	DB4	Data Bus Line
4	$\overline{WR}$	Data Write	14	DB5	Data Bus Line
5	$\overline{RD}$	Read Data	15	DB6	Data Bus Line
6	$\overline{CE}$	Chip Enable	16	DB7	Data Bus Line
7	C/D	Command/Data	17	FS	Font Select
8	$\overline{RES}$	Reset	18	NC	-
9	DB0	Data Bus Line	19	K	LED - or EL Backlight
10	DB1	Data Bus Line	20	A	LED + or EL Backlight

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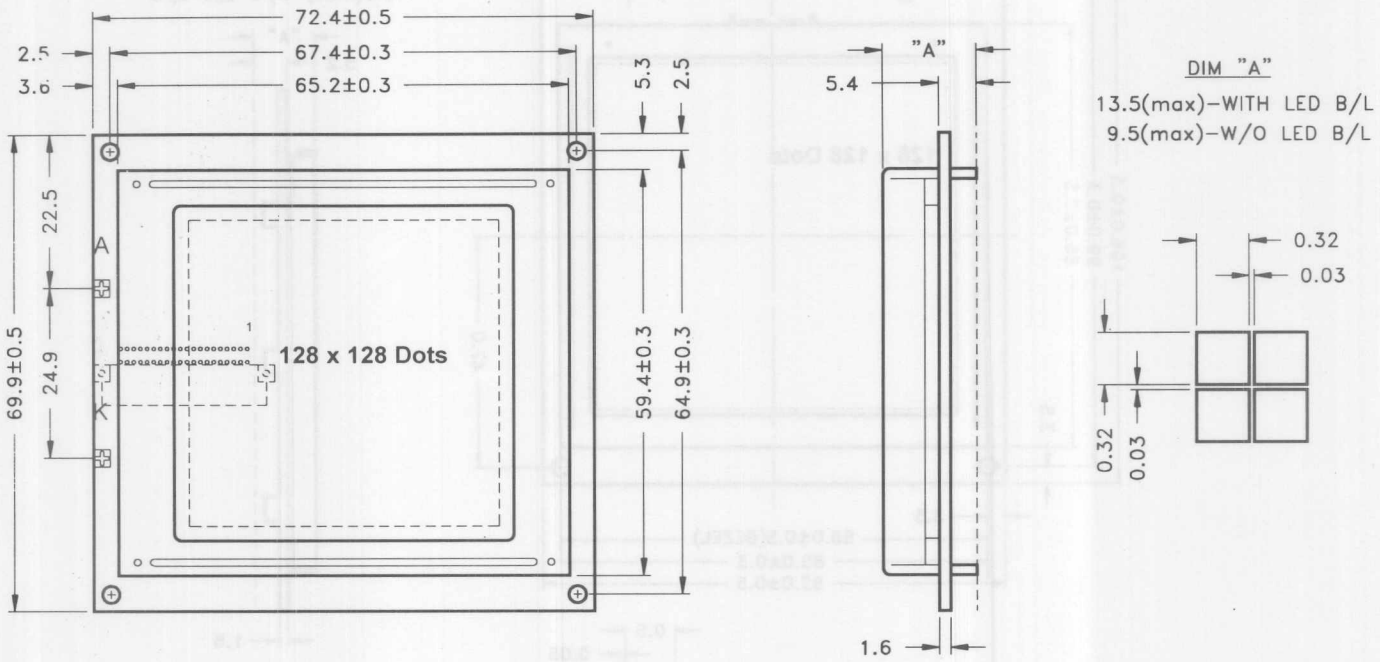
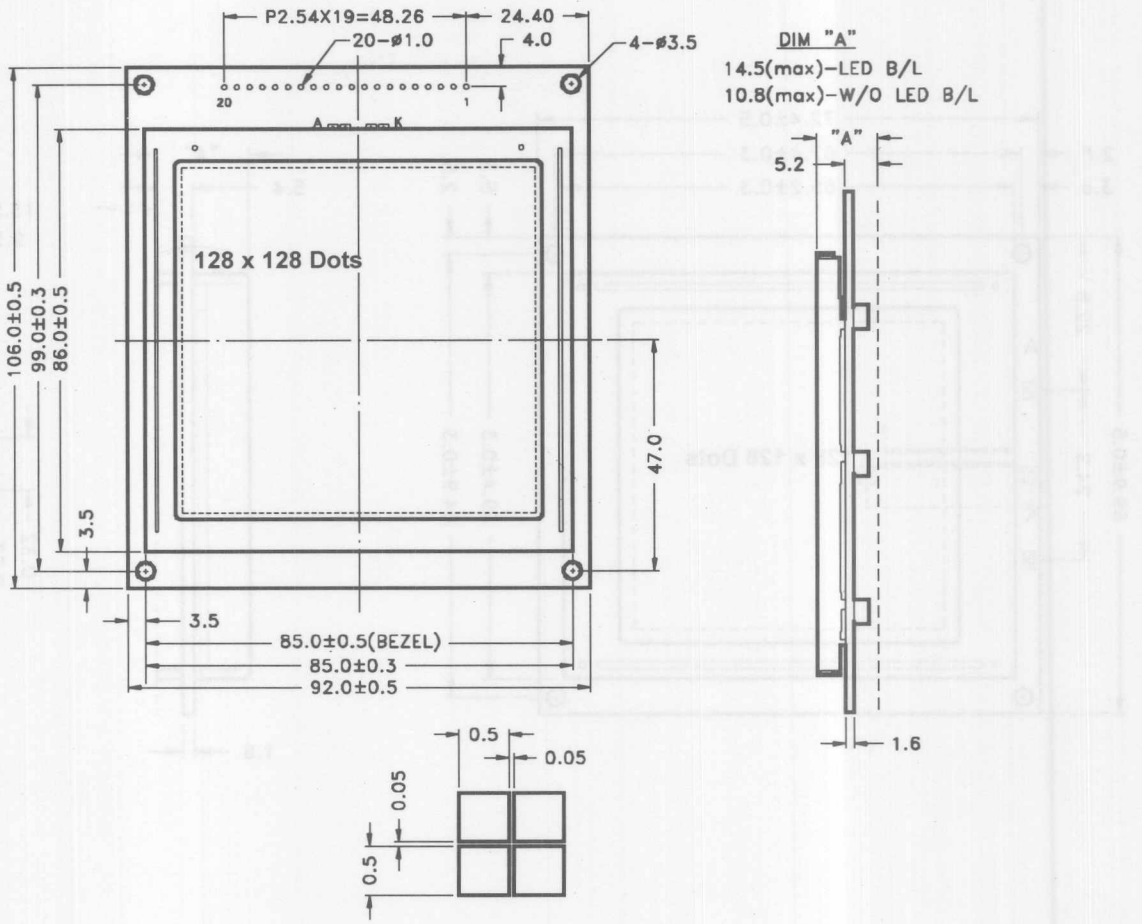


Pin pitch = 1.0mm

PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED
Temperature Range:	Standard
On-Board Controller:	LC7981

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	DB0	Data Bus Line	11	E	Enable
2	DB1	Data Bus Line	12	$\overline{CS}$	Chip Enable
3	DB2	Data Bus Line	13	$\overline{RES}$	Reset
4	DB3	Data Bus Line	14	Vee	Power Supply for LCD Driving
5	DB4	Data Bus Line	15	Vdd	+5V
6	DB5	Data Bus Line	16	Vss	Ground
7	DB6	Data Bus Line	17	NC	-
8	DB7	Data Bus Line	18	NC	-
9	RS	Instruction/Data	19	K	LED - or EL Backlight
10	R/$\overline{W}$	Read/Write	20	A	LED + or EL Backlight

AGM 1212D SERIES



PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
On-Board Controller:	T6963C

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	FGND	Frame Ground	12	DB2	Data Bus Line
2	GND	Ground	13	DB3	Data Bus Line
3	Vdd	+5V	14	DB4	Data Bus Line
4	Vo	LCD Contrast Voltage	15	DB5	Data Bus Line
5	$\overline{WR}$	Write Data	16	DB6	Data Bus Line
6	$\overline{RD}$	Read Data	17	DB7	Data Bus Line
7	$\overline{CE}$	Chip Enable	18	FS	Font Select
8	C/$\overline{D}$	Command/Data	19	Vee	Power Supply for LCD Drive
9	$\overline{RST}$	Reset	20	$\overline{HALT}$	Halt Controller Operation
10	DB0	Data Bus Line	A	LED +	Power Supply For LED B.L.
11	DB1	Data Bus Line	K	LED -	Power Supply For LED B.L.

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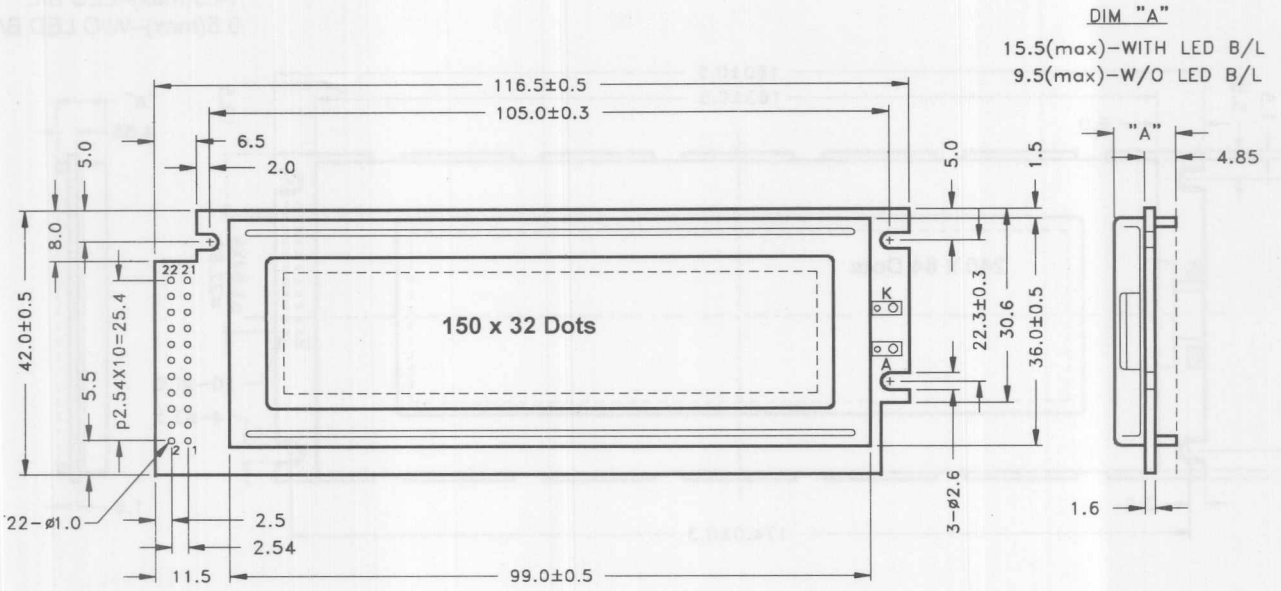
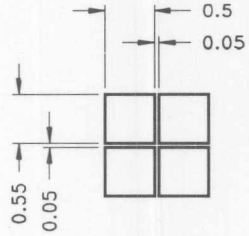


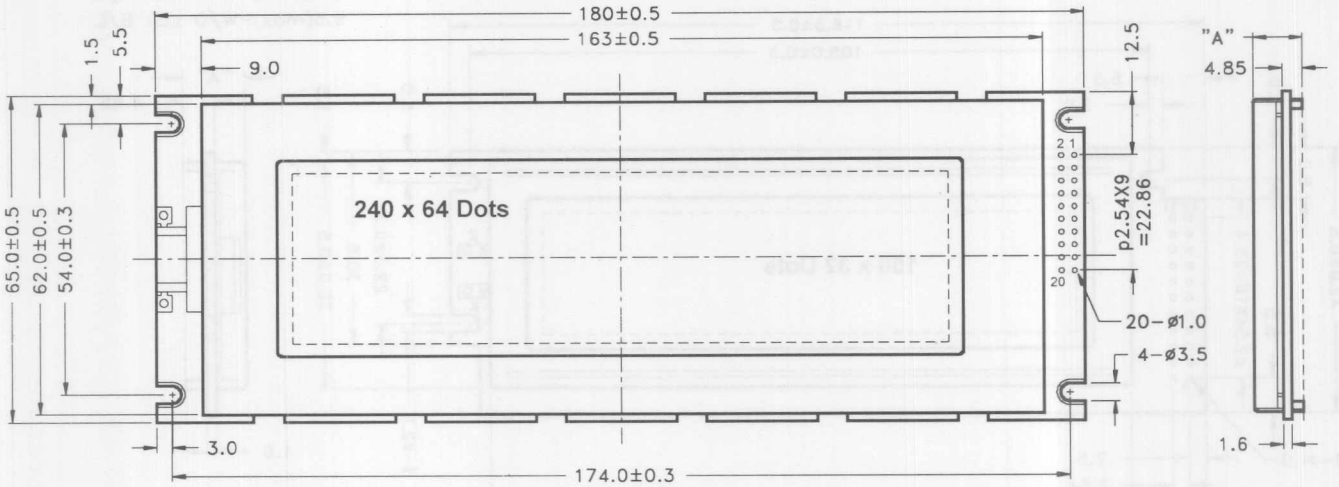


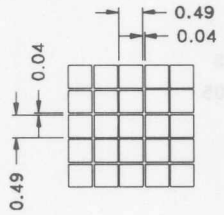
PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard
On-Board Controller:	T7932

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vss	Ground	13	DB6	Data Bus Line
2	Vdd	+5V	14	DB7	Data Bus Line
3	Vo	LCD Contrast Voltage	15	$\overline{CS1}$	Chip Select for IC1
4	D/$\overline{I}$	Data/Instruction	16	$\overline{CS2}$	Chip Select for IC2
5	R/$\overline{W}$	Read/Write	17	$\overline{CS3}$	Chip Select for IC3
6	E	Enable Signal	18	$\overline{RES}$	Reset
7	DB0	Data Bus Line	19	Vee	Power Supply for LCD Driving
8	DB1	Data Bus Line	20	NC	-
9	DB2	Data Bus Line	21	NC	-
10	DB3	Data Bus Line	22	NC	-
11	DB4	Data Bus Line	K	LED -	Power Supply For LED B.L.
12	DB5	Data Bus Line	A	LED +	Power Supply For LED B.L.

AGM 2464C SERIES

DIM "A"
14.5(max)–LED B/L
9.5(max)–W/O LED B/L





PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	EL, LED, CCFT*
Temperature Range:	Standard, Wide
On-Board Controller:	LC7981

*Call for drawing

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vss	Ground	12	DB5	Data Bus Line
2	Vdd	+5V	13	DB6	Data Bus Line
3	Vo	LED Contrast Voltage	14	DB7	Data Bus Line
4	RS	Instruction/Data	15	$\overline{CS}$	Chip Select
5	R/$\overline{W}$	Read/Write	16	$\overline{RES}$	Reset
6	E	Enable	17	Vee	Power Supply for LCD Driving
7	DB0	Data Bus Line	18	NC	-
8	DB1	Data Bus Line	19	NC	-
9	DB2	Data Bus Line	20	NC	-
10	DB3	Data Bus Line	A	LED +	Power Supply for EL, LED B.L.
11	DB4	Data Bus Line	K	LED -	Power Supply for EL, LED B.L.

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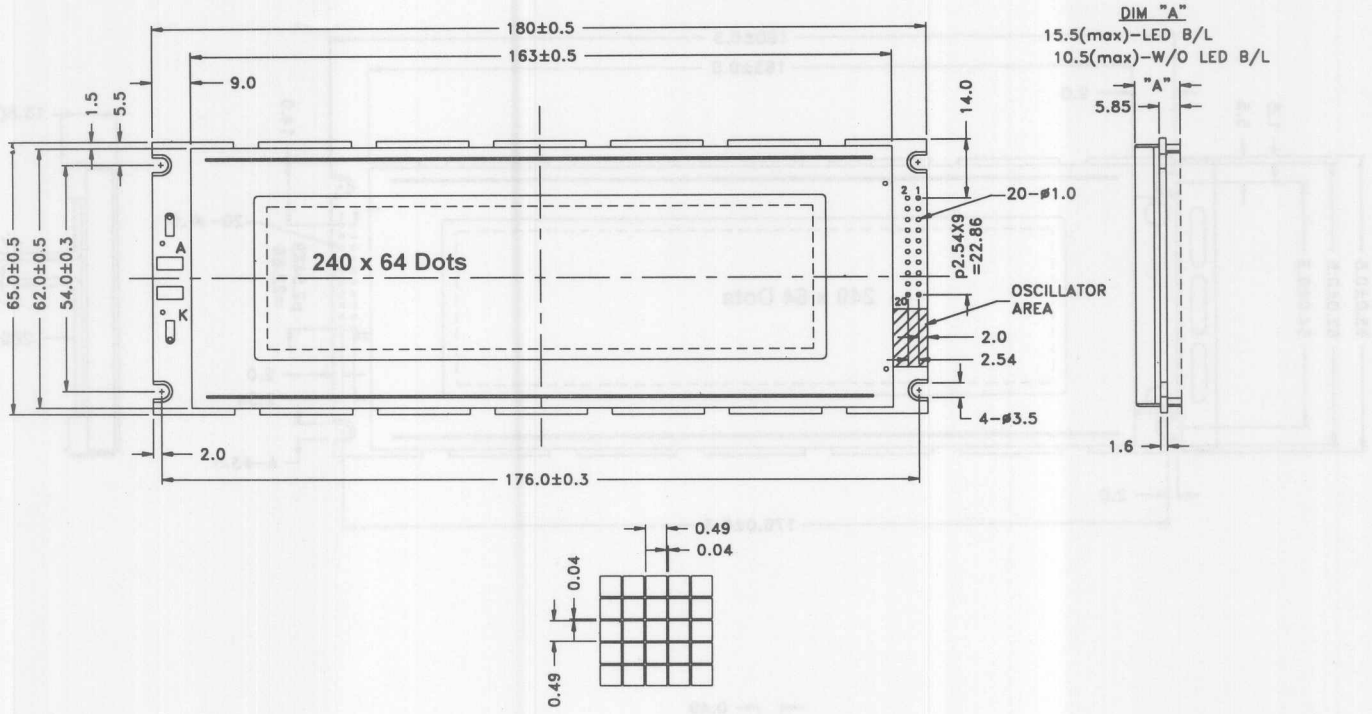
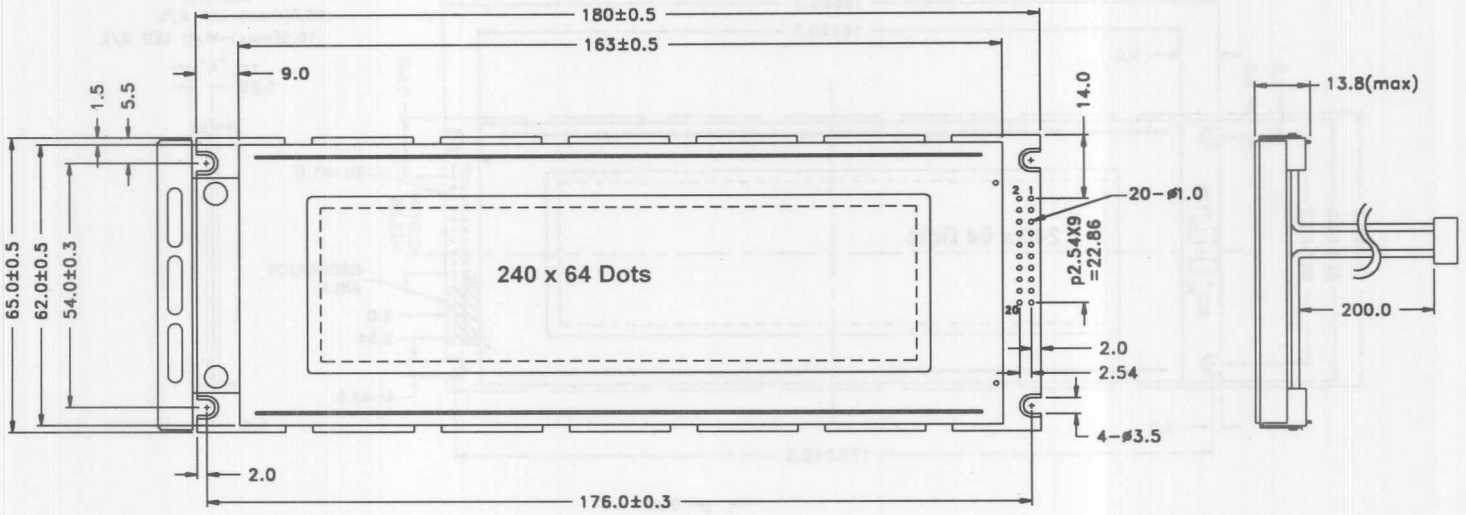
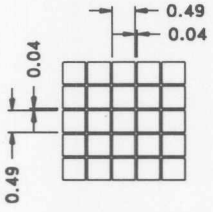


PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue), FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED
Temperature Range:	Standard, Wide
On-Board Controller:	T6963C

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	FGND	Frame Ground	12	DB1	Data Bus Line
2	Vss	Ground	13	DB2	Data Bus Line
3	Vdd	+5V	14	DB3	Data Bus Line
4	Vee	Power Supply for LCD Driving	15	DB4	Data Bus Line
5	$\overline{WR}$	Write Data	16	DB5	Data Bus Line
6	$\overline{RD}$	Read Data	17	DB6	Data Bus Line
7	$\overline{CE}$	Chip Enable	18	DB7	Data Bus Line
8	C/$\overline{D}$	Command/Data	19	FS	Font Select
9	NC	-	20	NC	-
10	$\overline{RES}$	Reset	A	LED +	Power Supply For EL, LED B.L.
11	DB0	Data Bus Line	K	LED -	Power Supply For EL, LED B.L.

AGM 2464D SERIES w/CCFT backlighting





PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transflective, Transmissive
Backlight:	CCFT
Temperature Range:	Standard, Wide
On-Board Controller:	T6963C

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	FGND	Frame Ground	11	DB0	Data Bus Line
2	Vss	Ground	12	DB1	Data Bus Line
3	Vdd	+5V	13	DB2	Data Bus Line
4	Vee (Vo)	Power Supply for LCD Driving	14	DB3	Data Bus Line
5	$\overline{WR}$	Write Data	15	DB4	Data Bus Line
6	$\overline{RD}$	Read Data	16	DB5	Data Bus Line
7	$\overline{CE}$	Chip Enable	17	DB6	Data Bus Line
8	C/$\overline{D}$	Command/Data	18	DB7	Data Bus Line
9	$\overline{NC}$	-	19	FS	Font Select
10	$\overline{RES}$	Reset	20	NC	-

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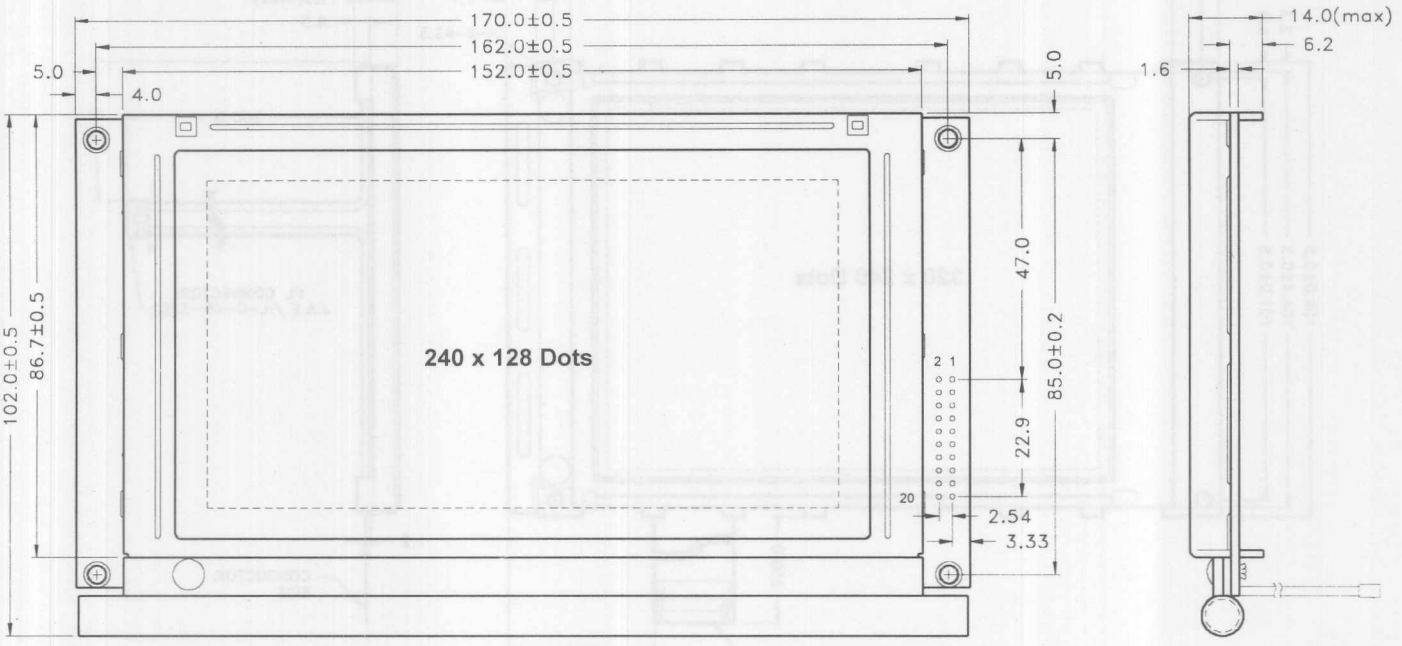
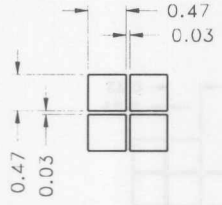
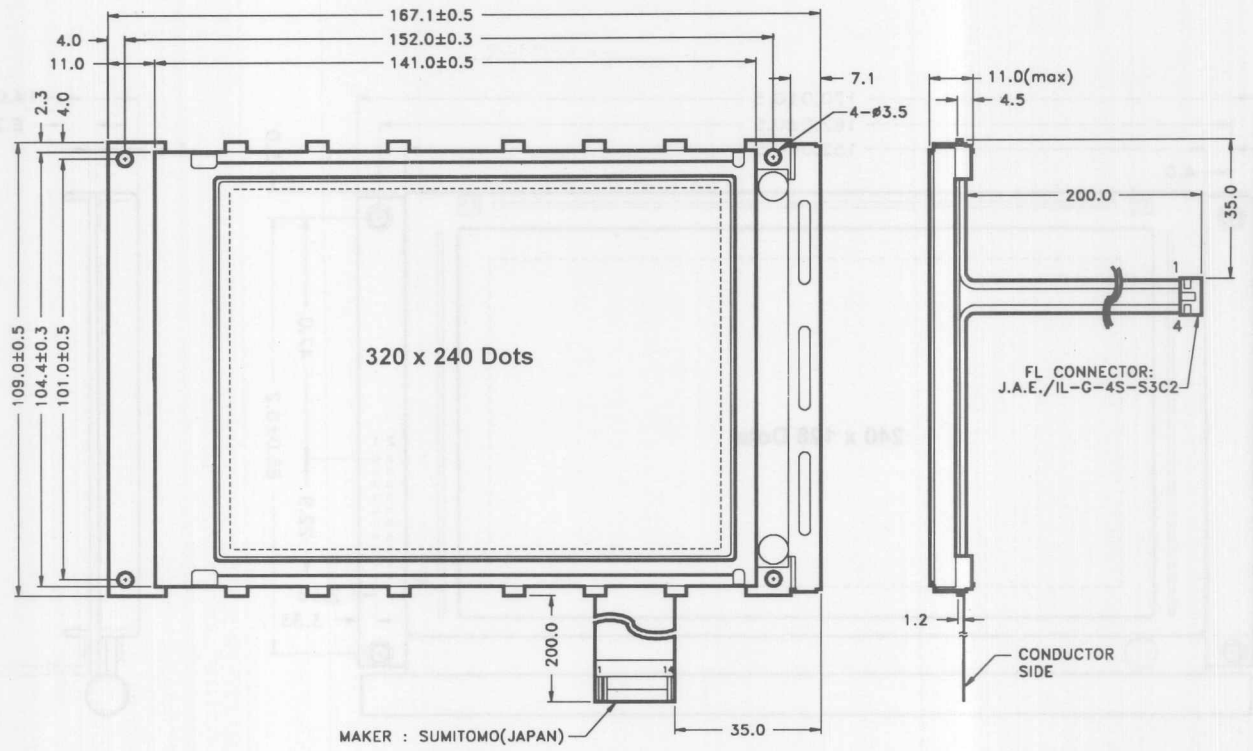


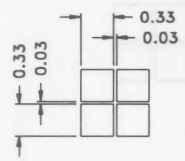


PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transflective
	Transmissive
Backlight:	CCFT
Temperature Range:	Standard
On-Board Controller:	T6963C

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	FGND	Frame Ground	11	DB0	Data Bus Line
2	GND	Ground	12	DB1	Data Bus Line
3	Vdd	+5V	13	DB2	Data Bus Line
4	Vee	Power Supply for LCD Driving	14	DB3	Data Bus Line
5	$\overline{WR}$	Write Data	15	DB4	Data Bus Line
6	$\overline{RD}$	Read Data	16	DB5	Data Bus Line
7	$\overline{CE}$	Chip Enable	17	DB6	Data Bus Line
8	C/$\overline{D}$	Command/Data	18	DB7	Data Bus Line
9	NC	-	19	FS	Font Select
10	$\overline{RES}$	Reset	20	RV	Reverse Video

AGM 3224D SERIES





Pin pitch = 1.0mm

PIN	SIGNAL	FUNCTION
1	DB0	Data Bus Line
2	DB1	Data Bus Line
3	DB2	Data Bus Line
4	DB3	Data Bus Line
5	$\overline{\text{DOFF}}$	Display On\Off
6	FLM	First Line Marker
7	M	Control Signal AC (internallly connected)
8	CL1	Data Latch Clock
9	CL2	Data Shift Clock
10	Vdd	+5V
11	Vss	Ground
12	Vee	Power Supply For LCD Driving
13	Vo	LCD Contrast Voltage
14	FGND	Frame Ground

PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transflective, Transmissive
Backlight:	CCFT
Temperature Range:	Standard, Wide
On-Board Controller:	None

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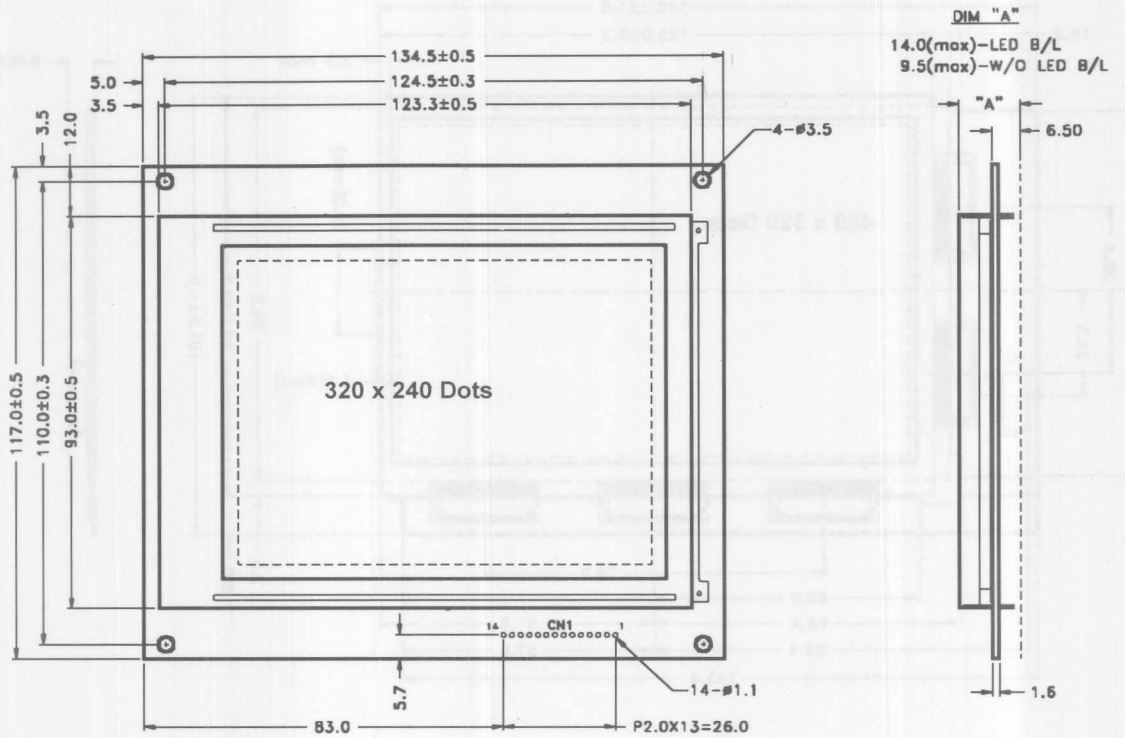
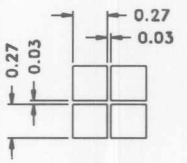


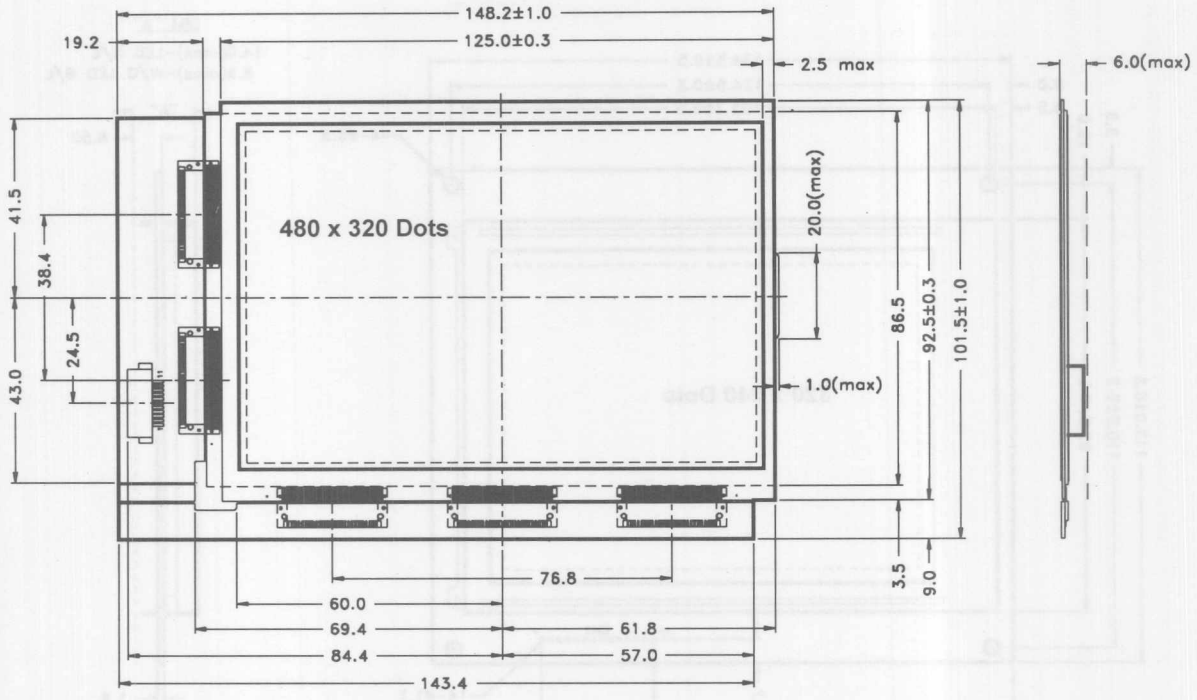


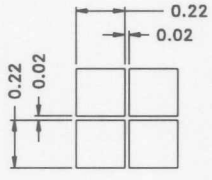
PERFORMANCE FEATURES	
LC Fluid:	STN (gray, yellow, blue)
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	LED, CCFT*
Temperature Range:	Standard, Wide
Controller:	None

*Call for drawing

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vo	LCD Contrast Voltage	8	Vdd	+5V
2	Vee	Power Supply For LCD Driving	9	CL2	Data Shift Clock
3	D3	Data Bus Line	10	CL1	Data Latch Clock
4	D2	Data Bus Line	11	FLM	First Line Marker
5	D1	Data Bus Line	12	LED -	Power Supply For LED B.L.
6	D0	Data Bus Line	13	LED +	Power Supply For LED B.L.
7	Vss	Ground	14	NC	-

AGM 4832B SERIES





PIN	SIGNAL	FUNCTION
1	FLM	First Line Marker
2	CL1	Data Latch Clock
3	CL2	Data Shift Clock
4	$\overline{\text{DOFF}}$	Display OFF Conttrol
5	Vdd	+5V
6	Vss	Ground
7	Vee	LCD Driving Voltage
8	D0	Data Bus Line
9	D1	Data Bus Line
10	D2	Data Bus Line
11	D3	Data Bus Line

PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Reflective
Backlight:	None
Temperature Range:	Standard
On-Board Controller:	None

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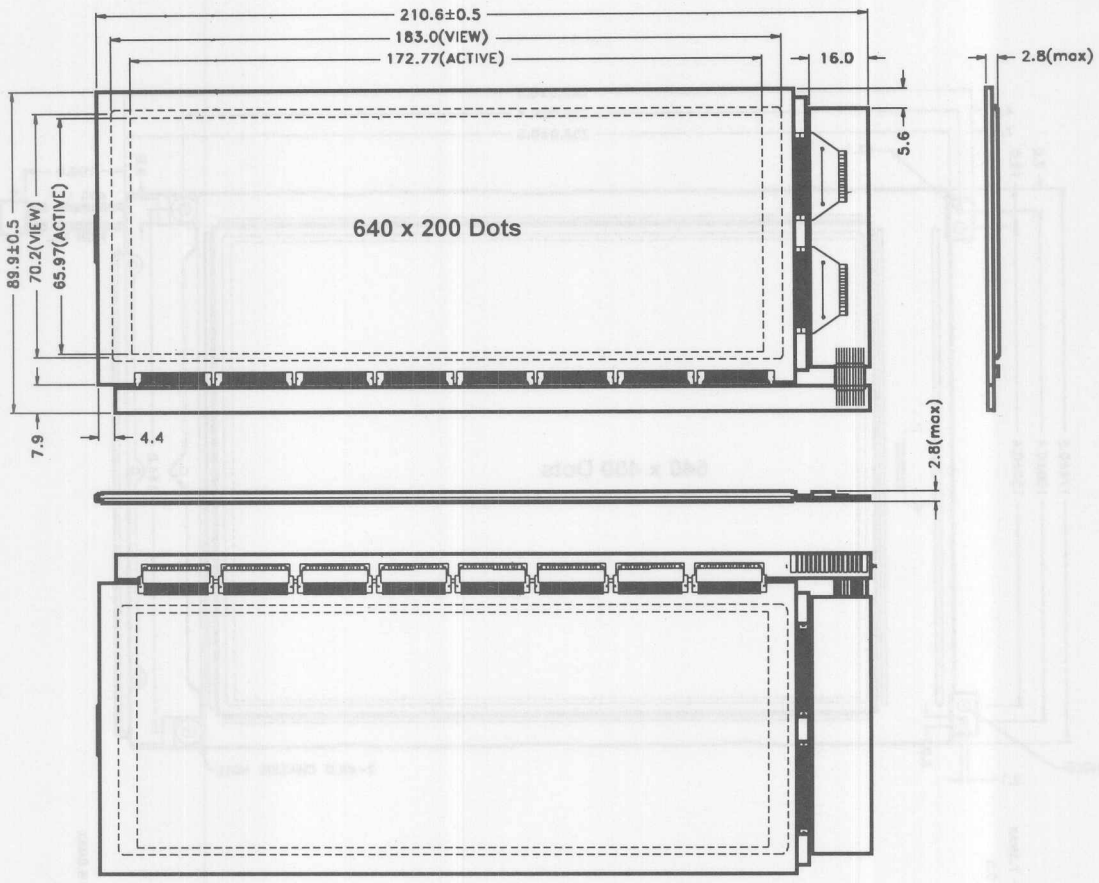

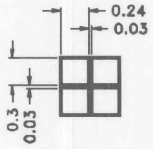

PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Reflective, Transflective
	Transmissive
Backlight:	None
Temperature Range:	Standard
On-Board Controller:	None

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	Vdd	+5V	9	D2	Data Bus Line
2	Vss	Ground	10	D3	Data Bus Line
3	FLM	First Line Marker	11	V1	Drive Voltage Level
4	CL1	Data Latch Clock	12	V2	Drive Voltage Level
5	CL2	Data Shift Clock	13	V3	Drive Voltage Level
6	M	Control Signal For AC Driving	14	V4	Drive Voltage Level
7	D0	Data Bus Line	15	V5	Drive Voltage Level
8	D1	Data Bus Line	16	V6	Drive Voltage Level

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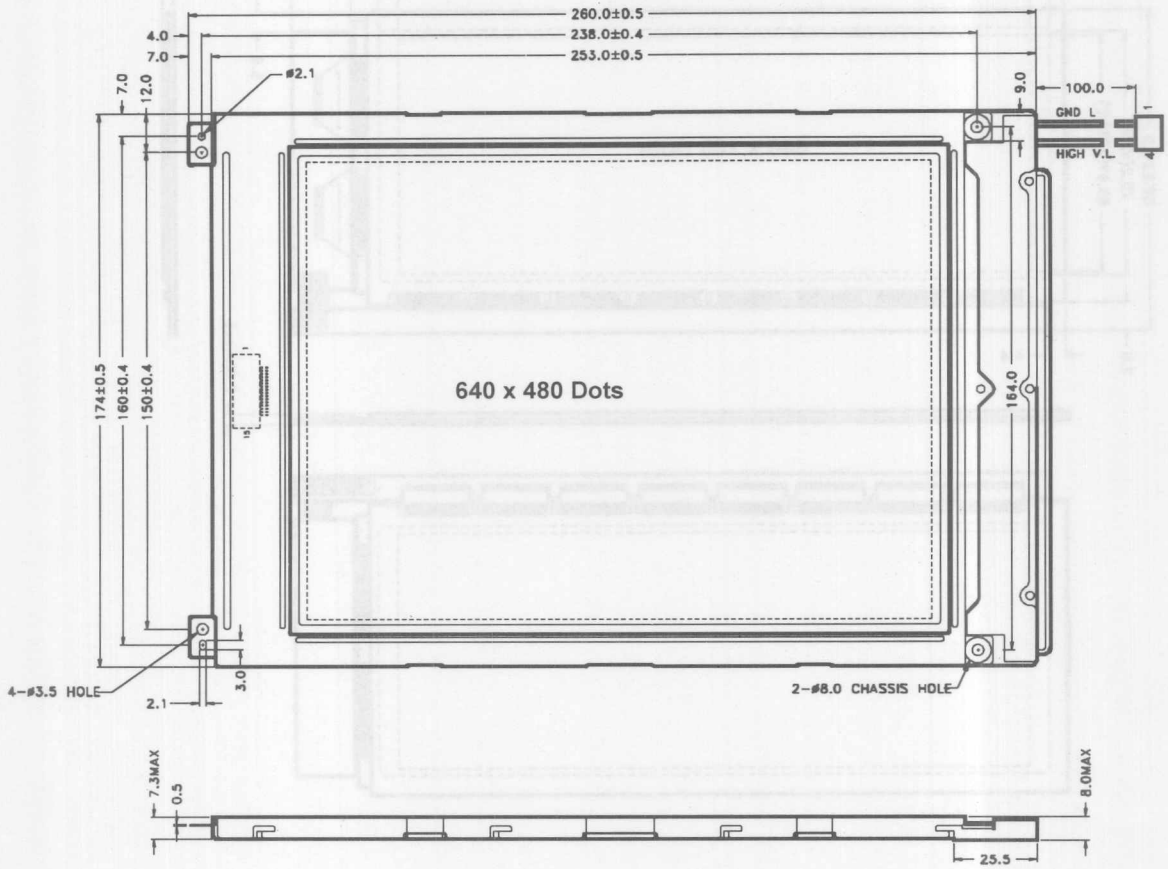
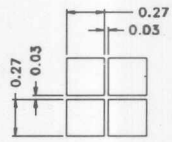
AGM6448C SERIES





PIN	SIGNAL	FUNCTION
1	FLM	First Line Marker
2	CL1	Data Latch Clock
3	CL2	Data Shift Clock
4	$\overline{\text{D. OFF}}$	Display On/Off
5	Vdd	+5V
6	Vss	Ground
7	Vee	Power Supply for LCD Driving
8	DU0	Data Bus Line (Upper)
9	DU1	Data Bus Line (Upper)
10	DU2	Data Bus Line (Upper)
11	DU3	Data Bus Line (Upper)
12	DL0	Data Bus Line (Lower)
13	DL1	Data Bus Line (Lower)
14	DL2	Data Bus Line (Lower)
15	DL3	Data Bus Line (Lower)
16	M	Control Signal For AC Driving

PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transflective, Transmissive
Backlight:	CCFT
Temperature Range:	Standard
On-Board Controller:	None

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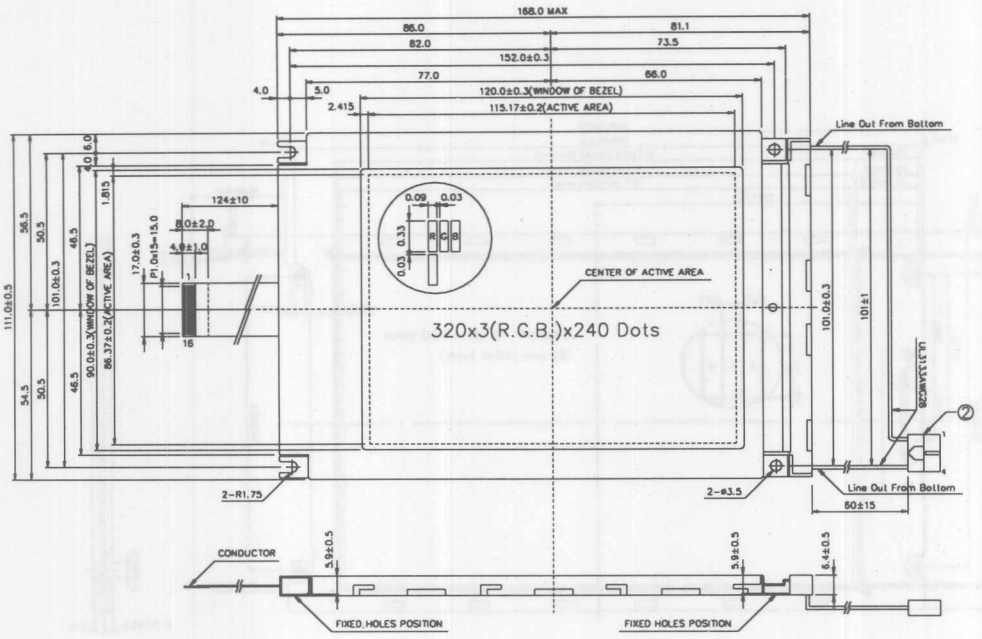
AGM 3224W SERIES COLOR



PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transflective
Backlight:	CCFL
Temperature Range:	Standard
On-Board Controller:	None

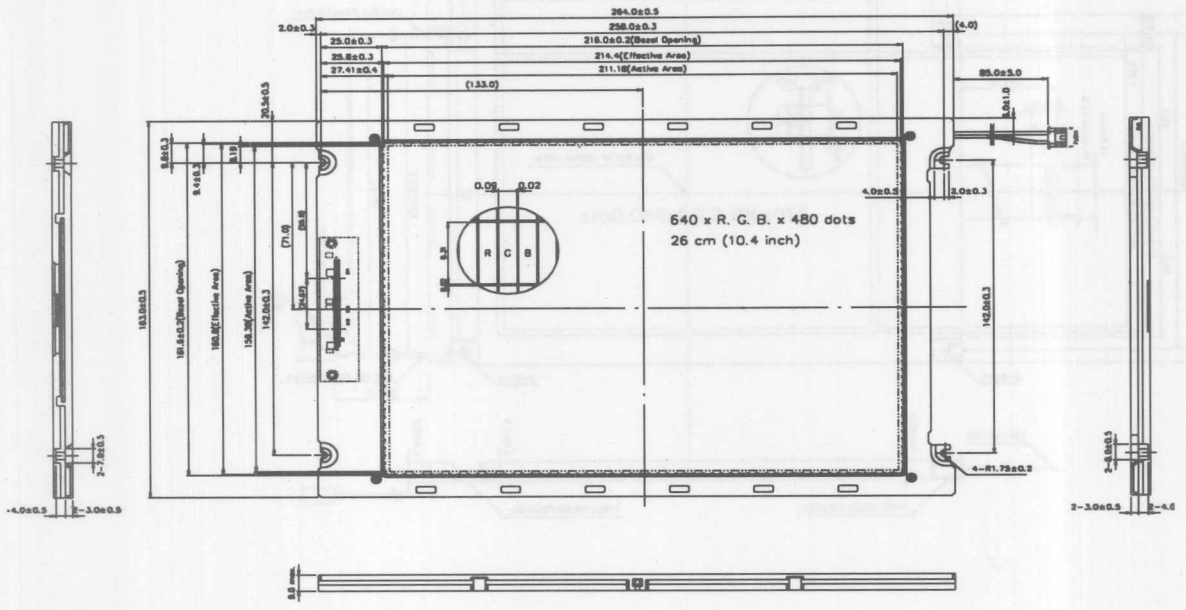
PIN ASSIGNMENT OF CCFL CONNECTION

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	FLM	First Line Marker	9	D1	Display Data
2	LP	Data Latch Signal	10	D2	Display Data
3	CP	Data Shift Clock Signal	11	D3	Display Data
4	$\overline{\text{DISPOFF}}$	H: Display On L: Display Off	12	D4	Display Data
5	Vdd	Power Supply for Logic	13	D5	Display Data
6	Vss	Power Supply (0V, GND)	14	D6	Display Data
7	Vlcd	Power Supply for LCD Drive	15	D7	Display Data
8	D0	Display Data	16	Vss	Power Supply (0V, GND)

PIN ASSIGNMENT OF CCFL CONNECTION

PIN	SIGNAL	FUNCTION	PIN	SIGNAL	FUNCTION
1	HOT	Power Supply for CCFL (HOT)	3	NC	No Connection
2	NC	No Connection	4	GND	Power Supply for CCFL (0V, GND)

AGM6448V SERIES
COLOR



PERFORMANCE FEATURES	
LC Fluid:	FSTN
Polarizer:	Transmissive
Backlight:	CCFT
Temperature Range:	Standard
On-Board Controller:	None

FLCN1: M63M83-04 (Mitsumi)
CN1: 15Pin Molex 53261-1590
CN2: 14Pin Molex 5361-1490
OPTIONAL
CN3: 30Pin JAE/IL-402-30S-S1L-SA

PIN	SIGNAL	FUNCTION
1	FLM	FLM signal indicates the beginning of each display cycle
2	NC	
3	$\overline{\text{DISP OFF}}$	H: Display ON, L: Display OFF
4	CL1	CL1 latches serial data in the shift registers
5	Vss	GND
6	CL2	Clock signal for shifting data
7	Vss	GND
8	UDD	Display data upper column driver
9	UD1	Display data upper column driver
10	UD2	Display data upper column driver
11	UD3	Display data upper column driver
12	UD4	Display data upper column driver
13	UD5	Display data upper column driver
14	UD6	Display data upper column driver
15	UD7	Display data upper column driver

PIN	SIGNAL	FUNCTION
1	LDD	Display data lower column driver
2	LD1	Display data lower column driver
3	LD2	Display data lower column driver
4	LD3	Display data lower column driver
5	LD4	Display data lower column driver
6	LD5	Display data lower column driver
7	LD6	Display data lower column driver
8	LD7	Display data lower column driver
9	VDD	+5V
10	Vss	GND
11	Vss	GND
12	Vee	Power supply voltage for LCD (+)
13	Vee	Power supply voltage for LCD (+)
14	Vee	Power supply voltage for LCD (+)

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HANDLING AND USAGE PRECAUTIONS

Handling

1. LCD modules are fragile - always handle gently.
2. Do not disassemble, drop, bend or twist the module.
3. Do not bend, twist or make any modifications to metal bezel tabs.
4. Do not modify or add extra holes on the PCB.
5. Do not change the positions of components on the module PCB.
6. Do not modify the pattern wiring on the PCB.
7. Do not modify or contact the elastomeric connector under any circumstances.
8. Do not make any alterations with a soldering iron with the exception of installing the interface connector.
9. In case of breakage:
   - The fluid in the LCD panel is toxic, do not swallow.
   - If the fluid contacts the skin, thoroughly wash with soap and warm water.
10. The front surface of the LCD panel has a plastic polarizer layer which is easily scratched. Remove the protective liner following installation and then do not touch, press, or rub the polarizer surface.
11. Cleaning instructions for the polarizer:
    - Wipe gently with an absorbent cotton cloth dampen with a plastic lens cleaner.
    - Never use organic solvents.
    - Some contaminants can be lifted by using scotch tape.

Installation

1. Solder only to the I/O and backlight terminals.
2. Use a high quality Sn/Pb eutectic solder (60-63% tin).
3. Soldering iron temperature should not exceed 260°C.
4. Soldering time should be approximately 3-4 seconds.
5. Always ground the soldering iron.
6. Remove any soldering flux after soldering, taking precautions not to contact the LCD polarizer or the elastomeric connectors with flux residue.
7. Always install the module behind a protective plastic or glass window to prevent scratching of the polarizer film.

Operation

1. Turn off power before installing or disconnecting the module.
2. Do not operate the module above the maximum ratings.
3. Operate within the temperature specification.
4. Lower temperatures increases the LC fluid viscosity and results in slower response times.
5. Higher temperatures will turn the entire display face dark.
6. Viewing angle is dependent on the driving voltage(Vo) of the liquid crystal.
7. After turning power on, input each signal after the positive and negative supply voltages become stable.
8. Try to use a separate +5 VDC line to the Vdd pin on the LCD module to avoid voltage transients.
9. Prevent reverse polarity while connecting the module.
10. Do not keep a load on any of the logic or data bus lines, when power is OFF on the module.
11. Minimize the length of cable between the module and MPU. Long cables over 12 in. may create noise.

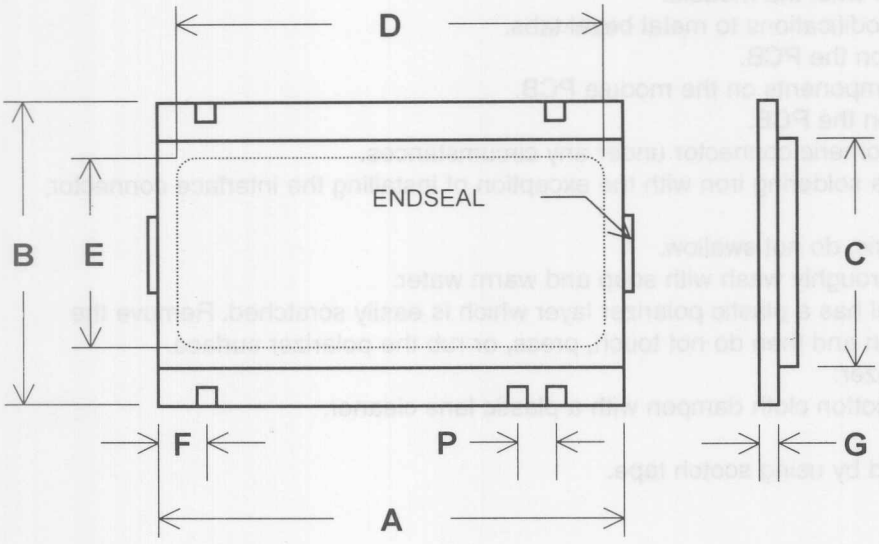
ESD Protection

1. ESD protection is always required.
2. The modules contain CMOS LSI chips which are sensitive to ESD Discharge.
3. Always ground yourself before handling the module.
4. Do not touch connector terminals, PCB traces or LSI chip leads without proper grounding.
5. Always ground all tools required during assembly.
6. Before handling make sure that you and the module have the same electric potential.
7. The working environment should have a relative humidity of 50%-60% to reduce static electricity.

Storage

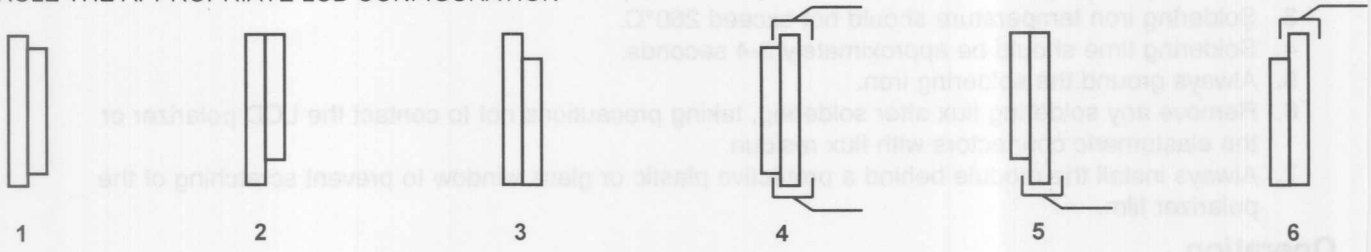
1. Store in an ambient temperature of 5°C - 45°C, and relative humidity of 40%-60%.
2. Store in a clean, ESD free environment.
3. Store in a sealed polyethylene bag. If properly sealed, there is no need for a desiccant.

CUSTOM LCD PANEL DESIGN FORM



A. WIDTH OF GLASS	mm
B. LARGE GLASS HEIGHT	mm
C. SMALL GLASS HEIGHT	mm
D. VIEWING AREA	mm
E. VIEWING AREA	mm
F. FIRST CONTACT	mm
G. GLASS THICKNESS	mm
P. CONTACT PITCH	mm
ENDSEAL LOCATION LEFT ☐	RIGHT ☐

CIRCLE THE APPROPRIATE LCD CONFIGURATION



DRIVE METHOD			
DRIVER IC USED			
DRIVE VOLTAGE		FREQUENCY	
STATIC DRIVE ☐		MULTIPLEX DRIVE ☐	
DUTY		BIAS	
TEMPERATURE RANGE			
OPERATING	°C TO	°C	
STORAGE	°C TO	°C	

CONNECTOR TYPE			
ELASTOMERIC ☐		ATTACHED PINS ☐	
PIN QUANTITY		PIN LENGTH	mm
POLARIZER TYPE AND VIEWING DIRECTION			
REFLECTIVE ☐		TRANSMISSIVE ☐	
TRANSFLECTIVE ☐			
6 O'CLOCK ☐		12 O'CLOCK ☐	
POSITIVE IMAGE ☐		NEGATIVE IMAGE ☐	

OTHER REQUIREMENTS:

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1.0 ABSOLUTE MAXIMUM RATINGS

1.1 For Character Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE		UNIT
			MIN.	MAX.	
Supply Voltage for Logic	V_{DD} - V_{SS}	Ta = 25°C	0	7.0	V
Supply Voltage for LCD	V_{DD} - V_{EE}		0	6.5	V
Input Voltage	V_I		V_{SS}-0.3	V_{DD}+0.3	V
Operating Temperature (std)	Topr	-	0	50	°C
Storage Temperature (std)	Tstg	-	-20	70	°C
Operating Temperature (wide)	Topr	-	-20	70	°C
Storage Temperature (wide)	Tstg	-	-30	80	°C

1.2 For Graphic Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE		UNIT
			MIN.	MAX.	
Supply Voltage for Logic	V_{DD} - V_{SS}	Refer to individual module data sheet.			V
Supply Voltage for LCD	V_{DD} - V_{EE}				V
Input Voltage	V_I				V
Operating Temperature (std)	Topr	-	0	50	°C
Storage Temperature (std)	Tstg	-	-20	70	°C
Operating Temperature (wide)	Topr	-	-20	70	°C
Storage Temperature (wide)	Tstg	-	-30	80	°C

2.0 ELECTRICAL CHARACTERISTICS

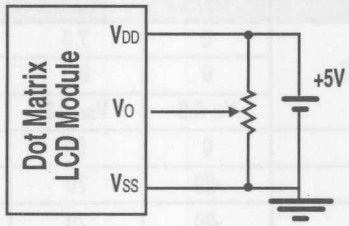
2.1 For Character Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Power Voltage	V_{DD}		4.75	5.00	5.25	V
Input H-level voltage	V_{IH}		2.2	-	V_{DD}	V
Input L-level voltage	V_{IL}		-0.3	-	0.3	V
Output H-level voltage	V_{OH}	-IOH=0.205mA	2.4	-	-	V
Output L-level voltage	V_{OL}	IOL=1.2mA	-	-	0.4	V
I/O leakage current	I_{IL}	vin=0~V_{DD}	-1	-	1.0	uA
Supply current	I_{DD}	V_{DD}=5V	-	2.0	5.0	mA
LCD operating voltage	V_{LCD}	V_{DD}-V_0	3.0	-	11.0	V

3.0 POWER SUPPLY SCHEMATICS

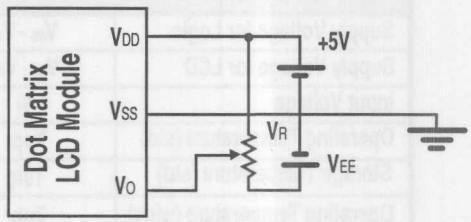
See individual module specification pages for voltage settings to obtain optimum contrast and viewing angle.
NOTE: V_R = Variable Resistor 10 K Ω to 20 KΩ for Adjusting Contrast

3.1 For Single Supply



For Character Modules With Standard Temperature Range Fluid and Graphics Modules With On-Board Negative Voltage Circuit.

3.2 For Dual Supply



For Character Modules With Wide Temperature Range Fluid and Graphics Modules Without On-Board Negative Voltage Circuit.

4.0 HOW TO USE AZ DISPLAYS CHARACTER MODULES

4.1 Dot Matrix LCD Controller & Driver

The module has a dot matrix LCD controller & driver LSI which is fabricated by low power CMOS technology.

Functions

- Character type dot matrix LCD controller & driver.
- Internal drivers : 16 common and 40 segment outputs.
- Display character format : 5x7 dots + cursor, 5x10 dots + 10.
- Easy interface with a 4 - bit or 8 -bit microprocessors.
- Display character pattern: On-chip Character Generator ROM (CG ROM).
- The special character pattern can be programmable by Character Generator RAM (CG RAM).
- A customer character pattern can be programmable by mask option.
- Automatic power on reset function.
- It is posssible to read both Character Generator and Display Data RAM from MPU.

Features

- Internal Memory
  - * Character Generator ROM : 8320 bits.
  - * Character Generator RAM : 512 bits.
  - * Display Data RAM : 80x8 bits for 80 digits.
- Supply voltage for logic and LCD (+) : +5V±10%.
- Supply voltage for LCD (-) : -5V.
- CMOS process.
- 1/8 duty, 1/11 duty or 1/16 duty : selectable (1/8 duty, 5x7 dots format 1 line, 1/11 duty ; 5x10 dots format 1 line, 1/16 duty : 5x7 dots format 2 lines.)

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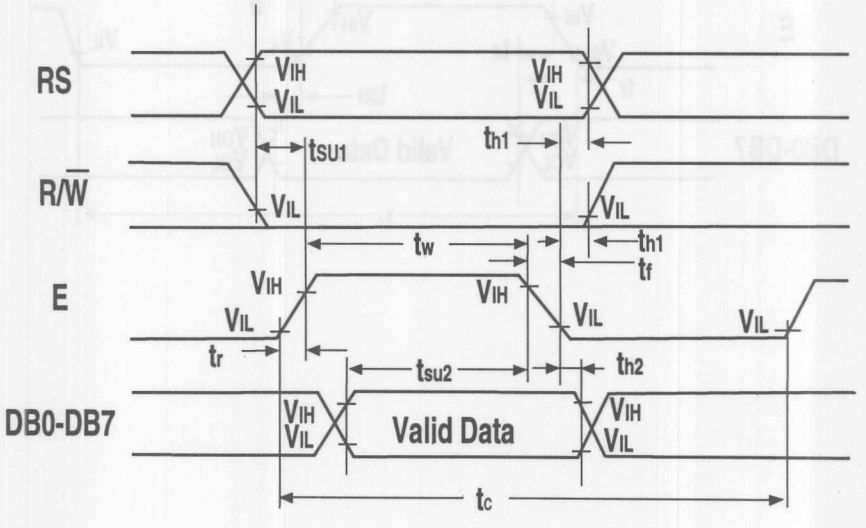
4.2 Character Module Interface Signals

SIGNAL	LEVEL	DESCRIPTION	FUNCTIONS
V_{SS}	-	Ground	OV
V_{DD}	-	Supply voltage for logic & LCD (+)	5V ± 5%
V_O	-	Supply voltage for LCD	LCD Contrast Adjust Voltage
RS	H/L	Register selection	H : Data L : Instruction code
R/W	H/L	Read/Write	H : Read L : Write
E	H,H → L	Enable signal	
DB0-DB7	H/L	Data bit 0-7	For 8 bit operation
DB4-DB7	H/L	Data bit 4-7	For 4 bit and 8 bit operation

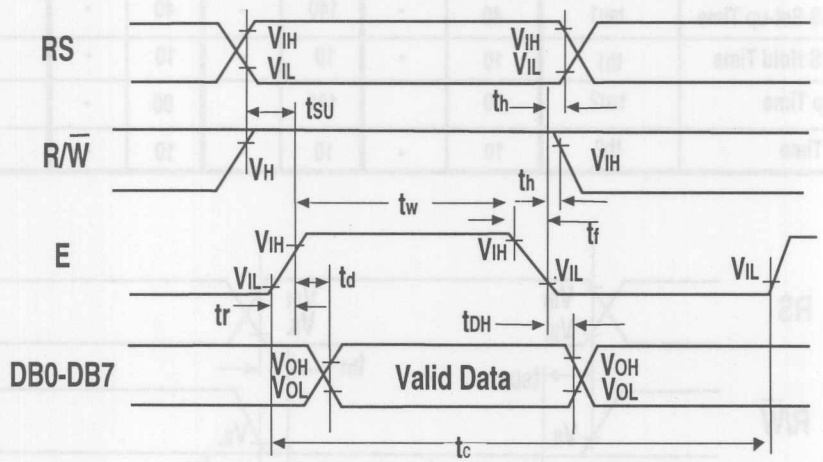
4.3 Bus Timing Characteristics - Write Operation

CHARACTERISTICS	SYMBOL	KS0066 KS0070 KS0076		MSM6222B		HD44780U		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
E Cycle Time	tc	500	-	667	-	500	-	ns
E Rise Time	tr	-	25	-	25	-	20	ns
E Fall Time	tf	-	25	-	25	-	20	ns
E Pulse Width (High, Low)	tw	220	-	280	-	230	-	ns
R/$\overline{W}$ and RS Set-up Time	tsu1	40	-	140	-	40	-	ns
R/$\overline{W}$ and RS Hold Time	th1	10	-	10	-	10	-	ns
Data Set-up Time	tsu2	60		180		80	-	ns
Data Hold Time	th2	10	-	10	-	10	-	ns



4.4 Bus Timing Characteristics - Read Operation

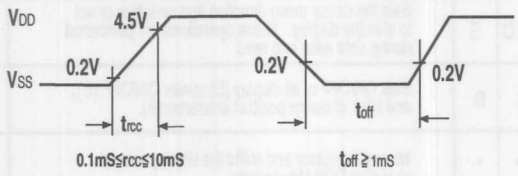
CHARACTERISTICS	SYMBOL	KS0066 KS0070 KS0076		MSM6222B		HD44780U		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
E Cycle Time	tc	500	-	667	-	500	-	ns
E Rise Time	tr	-	25	-	25	-	20	ns
E Fall Time	tf	-	25	-	25	-	20	ns
E Pulse Width	tw	220	-	280	-	230	-	ns
R/$\overline{W}$ and RS Set-up Time	tsu	40	-	140	-	40	-	ns
R/$\overline{W}$ and RS Hold Time	th	10	-	10	-	10	-	ns
Data Output Delay Time	td	-	120	-	220	-	160	ns
Data Hold Time	tdh	20	-	20	-	5	-	ns



4.5 Power Supply Reset

The internal reset circuit will not operate properly if the following power supply condition is not satisfied. In that case, perform initial setting according to the instruction.

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Power Supply Rise Time	trcc	0.1-	-	10	mS
Power Supply off Time	toff	1 -	-	-	mS



Note: The item toff defines the time when the power supply shuts down momentarily or repeats on off state.

Reset Function

The module automatically resets when power is turned on using the internal reset circuit. The following instructions are executed in initialization. The busy flag (BF) is kept in busy state until initialization ends. (BF=1) The busy state is 10ms after VDD rises to 4.5V.

1.) Display Clear
2.) Function Set
DL=1 : 8 bit interface data; DL=0 : 4 bit
F=0 :5x7 dot character font
N=# of display lines
3.) Display ON/OFF Control
D=0 :Display OFF
C=0 :Cursor OFF
B=0 :Blink OFF
4.) Entry Mode Set
1/D=1 : +1 (increment)
S=0 :No shift

Note: When conditions in "Power Supply Conditions Using Internal Reset Circuit" are not met, the internal reset circuit will not operate normally and initialization will not be performed. In this case initialize by MPU according to "Initializing by Instruction".

Intitializing by instruction

If the power supply conditions for correctly operating the internal reset circuit are not met, intialization by instruction is required.

Use the following procedure for initialization.

When interface is 8 bits long.

BF cannot be checked before this instruction Function set (interface is 8 bits long)

BF cannot be checked before this instruction Function set (interface is 8 bits long)

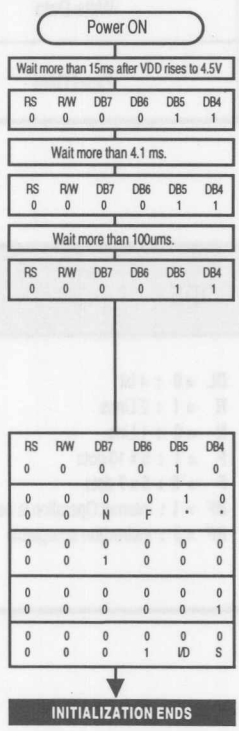
BF cannot be checked before this instruction Function set (interface is 8 bits long)

BF can be checked after the folowing instruction. When BF is not checked, the waiting time between instructions is longer than execution instruction time.
Function set (interface is 8 bits long. Specify the number of display lines and character font.) The number of display lines and character font cannot be changed afterwards.

Display ON

Display OFF

Entry Mode Set



When interface is 4 bits long.

BF cannot be checked before this instruction Function set (interface is 8 bits long)

BF cannot be checked before this instruction Function set (interface is 8 bits long)

BF cannot be checked before this instruction Function set (interface is 8 bits long)

BF can be checked after the following instruction. When BF is not checked, the waiting time between instrucctions is longer than execution instruction time. Function set (Set Interface to be 4 bits long). Interface is 8 bits length.

Function set (interface is 8 bits long. Specify the number of display lines and character font.)
The number of display lines and character font cannot be changed afterwards.

Display ON

Display OFF

Entry Mode Set

4.6 Instructions

INSTRUCTION	CODE										DESCRIPTION	EXECUTE TIME (MAX)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears all display and returns the cursor to the home position (Address 0).	1.64mS
Cursor at Home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (Address 0). Also returns the display being shifted to the original position. DDRAM contents remain unchanged.	1.64mS
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and specifies or not to shift the display. These operations are performed during data write and read.	40µS
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display (D) cursor ON/OFF (C), and blink of cursor position character (B).	40µS
Cursor / Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing DDRAM contents.	40µS
Function Set	0	0	0	0	1	DL	N	F	*	*	Sets interface data length (DL) number of display lines (L) and character font (F).	40µS
CGRAM Address Set	0	0	0	1	ACG						Sets the CGRAM address. CGRAM data is sent and received after this setting.	40µS
DDRAM Address Set	0	0	1	ADD							Sets the DDRAM address. DDRAM data is sent and received after this setting.	40µS
Busy Flag / Address Read	0	1	BF	AC							Reads Busy Flag (BF) indicating internal operation is being performed and reads address contr contents.	0µS
CGRAM / DDRAM Data Write	1	0	Write Data								Writes data into DDRAM or CGRAM.	40µS
CGRAM / DDRAM Data Read	1	0	Read Data								Reads data from DDRAM or CGRAM.	40µS

CODE		DESCRIPTION	EXECUTE TIME (MAX)
I/D = 1 : Increment **I/D** = 0 : Decrement **S** = 1 : With display shift **S/C** = 1 : Display Shift **S/C** = 0 : Cursor movement **R/L** = 1 : Shift to the right **R/L** = 0 : Shift to the left **D/L** = 1 : 8 bit	**DL** = 0 : 4 bit **N** = 1 : 2 Lines **N** = 0 : 1 Line **F** = 1 : 5 x 10 dots **F** = 0 : 5 x 7 dots **BF** = 1 : Internal Operation is being performed **BF** = 0 : Instruction acceptable	**DDRAM** : Display Data RAM **CGRAM** : Character Generator RAM **ACG** : CGRAM Address **ADD** : DDRAM Address, Corresponds to Cursor Address **AC** : Address Counter, used for both DDRAM and CGRAM * : Invalid	fcp or fosc = 250kHz However, when frequency changes, execution time also changes When fcp or fosc = 270kHz, $40\mu S \times \frac{250}{270} = 37\mu S$

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4.7 Display Character Position And Character Address

8 x 2 Module — Display Position

	1	2	3	4	5	6	7	8
line 1	00	01	02	03	04	05	06	07
line 2	40	41	42	43	44	45	46	47

DD RAM Address

16 x 1 Module — Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
line 1	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

DD RAM Address

16 x 2 Module — Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

DD RAM Address

20 x 2 Module — Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

DD RAM Address

24 x 2 Module — Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57

DD RAM Address

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TECHNICAL DATA

40 x 2 Module

Display Position

	1	2	3	4	5	6	7	8	9	10	11	12		33	34	35	36	37	38	39	40
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	_ _ _	20	21	22	23	24	25	26	27
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B		60	61	62	63	64	65	66	67

DD RAM Address

16 x 4 Module

Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
line 3	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
line 4	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F

DD RAM Address

20 x 4 Module

Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
line 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
line 3	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27
line 4	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67

DD RAM Address

40 x 4 Module

Display Position

	1	2	3	4		38	39	40
*line 1	00	01	02	03	_____ _____ _____	25	26	27
*line 2	40	41	42	43	_____ _____ _____	65	66	67
**line 3	00	01	02	03	_____ _____ _____	25	26	27
**line 4	40	41	42	43		65	66	67

DD RAM Address

*= Controller 1

** = Controller 2

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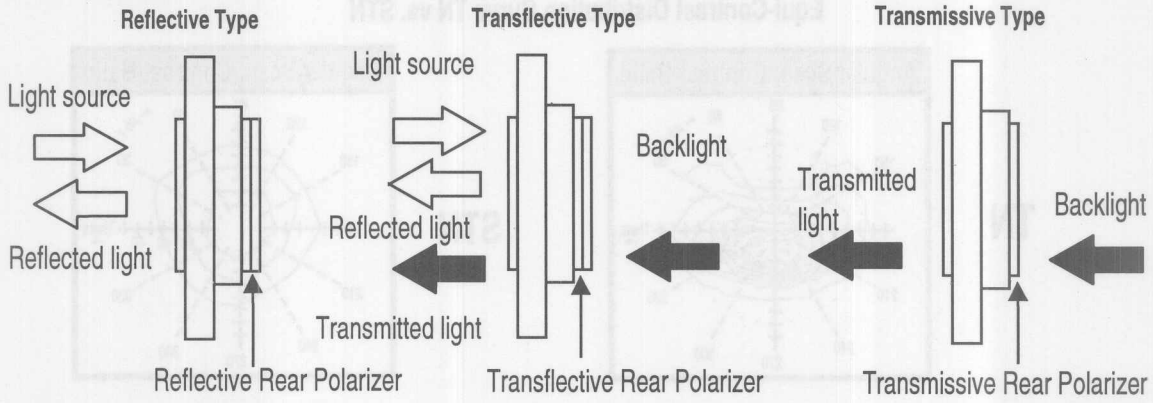
5.0 LCD PANEL

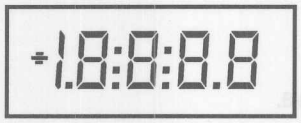
5.1 Features

- Low driving voltage, low power dissipation (0.2~2μA/cm²@5V$_{DC}$).
- Compact and thin structure.
- Custom artwork designs.
- Sunlight readable.

5.2 Viewing Modes

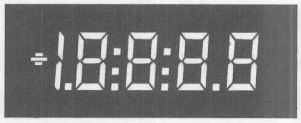


Positive Type



Positive type display requires no backlighting.

Negative Type



Negative type display requires backlighting.

5.3 LCD Modes

LCD MODE	COLOR MODE	DOT COLOR	BACKGROUND COLOR	STRUCTURE
TN	-	Black	Gray	Polarizer / Polarizer / Glass / LC — Twist angle 90°
STN	Yellow	Dark blue	Yellow-Green	Polarizer / Polarizer / STN Cell — Twist angle 180° to 240°
	Gray	Medium blue	Blue-Gray	
	Blue	White	Dark-Blue	
FSTN	-	Black	White	Polarizer / Polarizer / Compensation film / STN Cell

5.4 STN LCD

Principles

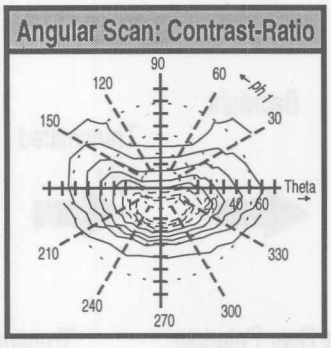
The following features are available STN mode:

- High contrast, wide viewing angle.
- Assurance of vertical viewing angle of display.

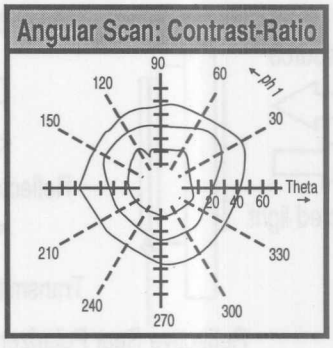
This technology has come to be widely used in the last several years, because it permits the use of the existing process and makes it possible to obtain a high picture quality at low cost.

Equi-Contrast Distribution Curve TN vs. STN

TN



STN



5.5 FSTN LCD

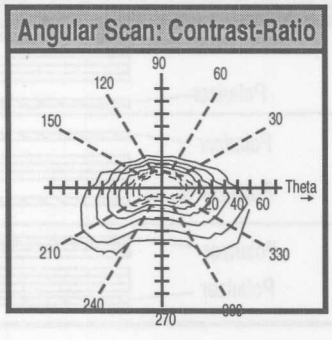
Features

- Clear and legible black and white display.
- High contrast and wide viewing angle at a high multiplex drive.
- Up to VGA resolution.
- Small temperature dependency of background color.
- Contrast of B/W display is approximately three times higher than STN.

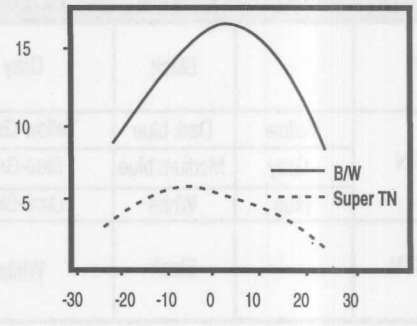
Principles

This technology is achieved by adding an optical retardation film to LC cell. The same driving method as STN is used.

Equi-Contrast Distribution Curve



Contrast vs. Viewing Angle



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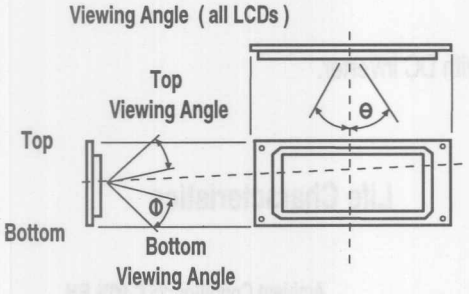
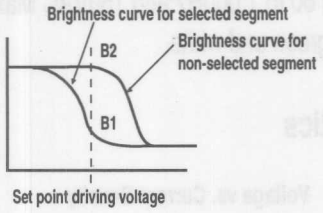
6.0 OPTICAL CHARACTERISTICS

Note 1.) Definition of Viewing Angle

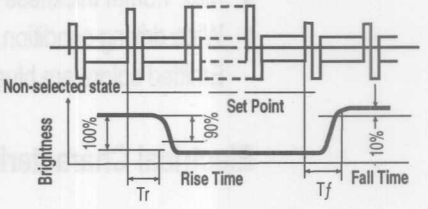


Note 2.) Definition of Contrast Ratio "K"

$$K = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



Note 3.) Definition of Optical Response Time



6.1 For TN Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT	NOTES TO SEE
			MIN.	TYP.	MAX.		
Viewing Angle	θ	K = 1.4	30	-	-	degree	1,2
	ϕ		-	-	30	degree	1,2
Contrast Ratio	K	ϕ = 20° θ = 0°	2.5	4	-	-	1,2
Response Time (rise)	Tr	ϕ = 0° θ = 0°	-	150	250	ms	3
Response Time (fall)	Tf	ϕ = 0° θ = 0°	-	150	250	ms	3

6.2 For STN Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT	NOTES TO SEE
			MIN.	TYP.	MAX.		
Viewing Angle	θ	K = 2.0	50	-	-	degree	1,2
	ϕ		-	-	± 40	degree	1,2
Contrast Ratio	K	ϕ = 0° θ = 0°	4	7	-	-	1,2
Response Time (rise)	Tr	ϕ = 0° θ = 0°	-	150	250	ms	3
Response Time (fall)	Tf	ϕ = 0° θ = 0°	-	150	250	ms	3

6.3 For FSTN Display Modules

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT	NOTES TO SEE
			MIN.	TYP.	MAX.		
Viewing Angle	θ	K = 2.5	50	-	-	degree	1,2
	ϕ		-	-	± 40	degree	1,2
Contrast Ratio	K	ϕ = 0° θ = 0°	7	10	-	-	1,2
Response Time (rise)	Tr	ϕ = 0° θ = 0°	-	150	250	ms	3
Response Time (fall)	Tf	ϕ = 0° θ = 0°	-	150	250	ms	3

7.0 BACKLIGHTS FOR LCD MODULES

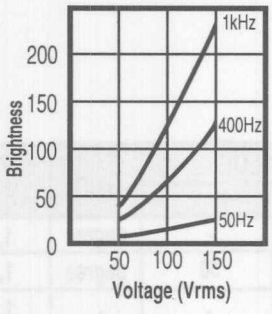
7.1 Electroluminescent (EL)

Features

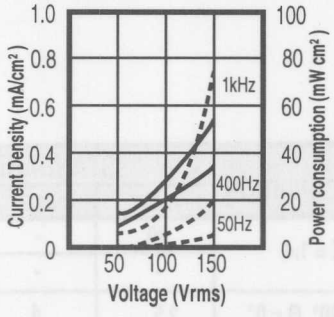
- Max 1.3mm thickness (Max 1.5mm for lead portion).
- Wide driving condition of 60 to 1,000Hz and 150VAC Max. with DC inverter. Emitted colors are blue-green and white.

Electrical Characteristics

Voltage vs. Brightness

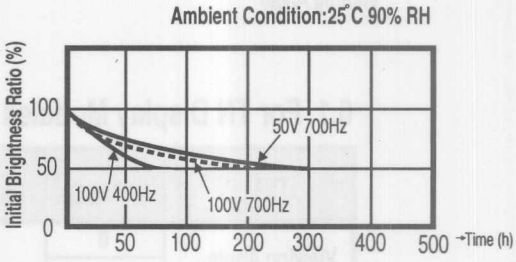


Voltage vs. Current Density



Current Density
Power Consumption

Life Characteristics



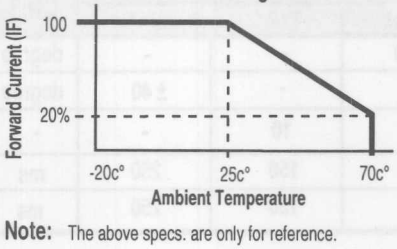
Constant Voltage/Frequency Drive
Inverter Drive

7.2 Light Emitting Diode (LED)

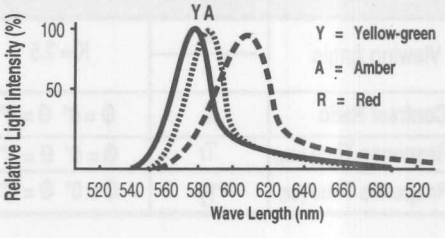
- Low voltage driving (+5V_{DC}) is available without inverter.
- Long life time 100,000 hours (average).
- No noise.
- Yellow-green (585nm) is the standard color. Red and amber colors are available as special order.

Electrical Characteristics (Reference Data)

Forward Current Derating Curve



Wave Length vs Relative Light Intensity



Note: The above specs. are only for reference.

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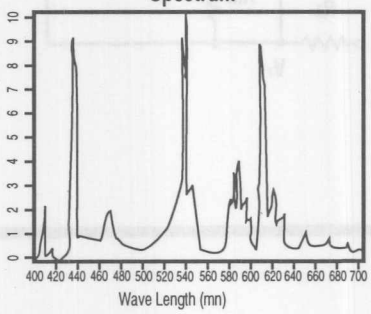
7.3 Cold Cathode Flourescent Lamp (CCFL)

Features

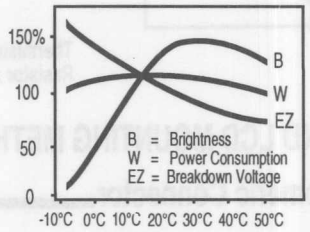
- High brightness of 3,000 - 4,000cd/m².
- OE lamp and AE lamp show color enhancement.
- Life time 20,000 hours.
- Low heat generation when operated at rated lamp current of 5-20mA.

Electrical Characteristics (Reference Data)

Spectrum

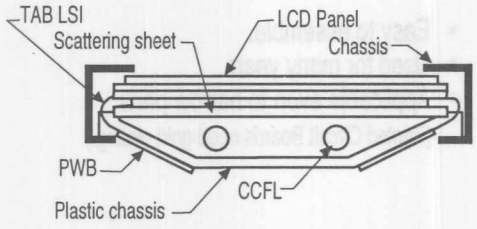


Temperature Characteristics Curve

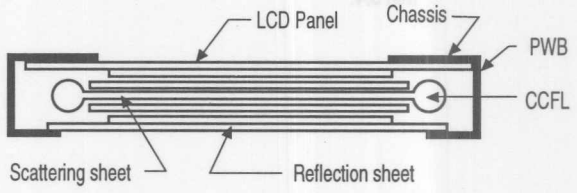


CCFL Backlight

The CCFL backlight provides two to three times the luminance of the EL backlight. In comparison to the EL backlight, which is used as an auxilary device to backlight the LCD unit in dark places, the CCFL backlight enhances the readability of LCD unit in offices with even brighter service environments.



Direct Lighting Method (example)



Edge Lighting Method (example)

(Ta=25°)

	CHARACTERISTICS	DIRECT LIGHTING	EDGE LIGHTING	REMARKS
1	Luminescent Color	White	White	
2	Luminance	Approx 100 nt typ.	Approx 60 nt typ.	
3	Thickness (Unit base)	24.2mm max.	14mm max.	
4	Operating Voltage	1,500 Vrms AC max.	1,500 Vrms AC max.	
5	Power Consumption	Approx 3 to 6 W (including inverter)Approx 3.4W (CCFL only)CCFL : 2 PC	Approx 3 to 6 W (including inverter) Approx 3.4W (CCFL only) CCFL : 2 PC	To lower the power consumption, improved efficiency of inverter design is the key factor.
6	Life	20,000 hours (IL=5mA)	10,000 hours (IL=5mA)	Continuous operation, The definition of life differs for each model. Refer to specification.

Note: 1.) The above specs. are only for reference.
2.) LCD unit with detachable CCFL Backlight is also available.

8.0 EXAMPLES OF TEMPERATURE COMPENSATION CIRCUITS FOR EXTENDED TEMP. TYPE.

(ONLY FOR REFERENCE)

Figure 1

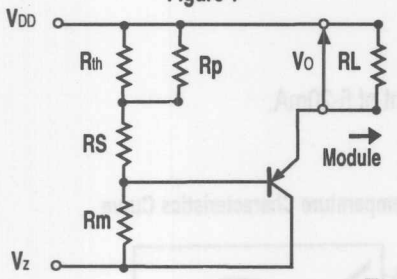
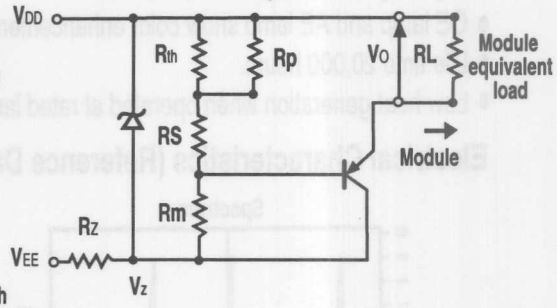


Figure 2

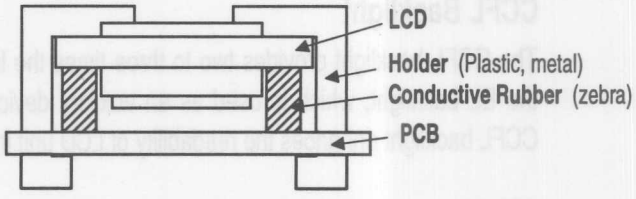


Thermistor : Rth
Resistor : R;, Rs, Rm

9.0 CONNECTOR AND LCD MOUNTING METHOD

9.1 Elastomeric Connector

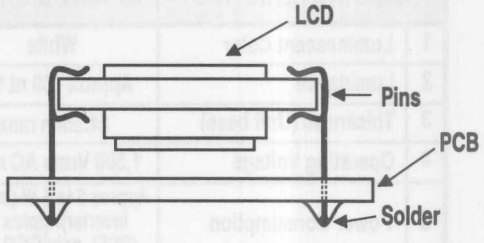
- Structure
  Alternate lamination of conductive rubber & insulating rubber.
- Connecting Method
  Mechanical compression.
- Pitch (mm)
  Min 0.4.



- Easy to assemble.
- Used for many years.
- Applicable even to narrow pads.
  (Printed Circuit Boards need gold plating.)

9.2 Pin Connector

- Structure
  Metal pins fit onto the panel terminal pad.
- Connecting Method
  Soldering.
- Pitch (mm)
  1.8, 2.0, 2.54.



- Suitable for small production runs.

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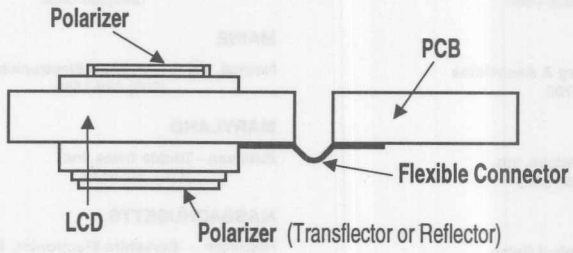
9.3 Flexible Connector

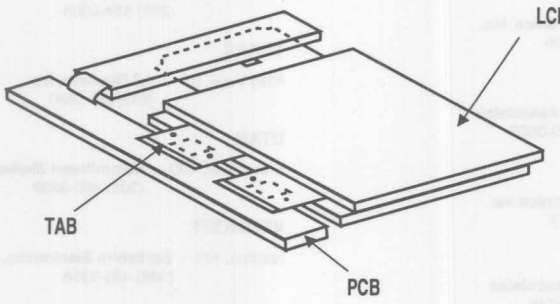
- Structure
  Film with electroconductive thin film.
- Connecting Method
  Heat and pressure fitting.
  Soldering or mechanical compression.
- Pitch (mm)
  Heat Seal : Min 0.4, Soldering Type : Min 0.8.



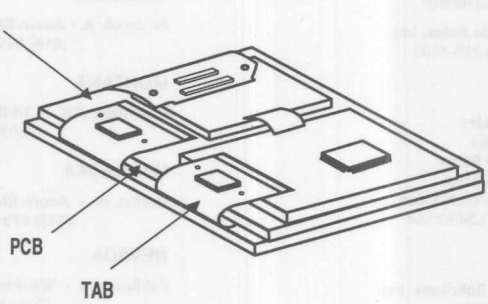
- A thin structure can be achieved.
- Flexible.
- Free trimming possible.

9.4 TAB

TAB (Tape Automated Bonding) + PCB



Foldable TAB + PCB



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